

**EPA Superfund
Record of Decision:**

**GOLDEN STRIP SEPTIC TANK SERVICE
EPA ID: SCD980799456
OU 01
SIMPSONVILLE, SC
09/12/1991**

Text:

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LAGOON CAPACITY (GALLONS)

1	640,000
2	70,000
3	450,000
4	840,000
5	775,000

IN THE SPRING OF 1989, PRIOR TO THE INITIATION OF THE REMEDIAL INVESTIGATION FIELD ACTIVITIES, INSTITUTIONAL CONTROLS WERE IMPLEMENTED TO RESTRICT ACCESS TO THE SITE. THESE CONTROLS INCLUDED THE CONSTRUCTION OF AN EIGHT-FOOT SECURITY FENCE AROUND THE WASTE MANAGEMENT AREA AND PLACEMENT OF WARNING SIGNS APPROXIMATELY EVERY 100 FEET ALONG THE FENCELINE, AS WELL AS OTHER STRATEGIC LOCATIONS THROUGHOUT THE PROPERTY. THE FENCED AREA INCLUDES APPROXIMATELY 10 ACRES CONTAINING THE FIVE INACTIVE WASTE LAGOONS. THE TRUCK TURNAROUND AREA AND THE ABANDONED DRUM AREA (SEE FIGURES 2 AND 3 FOR LOCATION) ARE NOT PRESENTLY INCLUDED IN THE FENCED AREA, AND AS SUCH, ACCESS TO THESE AREAS REMAINS UNRESTRICTED.

SURFACE FEATURES

THE TOPOGRAPHY AND OTHER RELEVANT SURFACE FEATURES OF THE SITE ARE ILLUSTRATED ON FIGURES 2 AND 3. THE MOST PROMINENT FEATURES OF THE GSST SITE ARE THE TWO REMAINING OPEN LAGOONS (NOS. 1 AND 4) AND AN UNNAMED STREAM WHICH ORIGINATES AT A SPRING LOCATED NEAR THE SOUTHWEST CORNER OF THE SITE AND FLOWS FROM THE SOUTH TO THE NORTH THROUGH THE SITE. THE UNNAMED STREAM IS A TRIBUTARY OF GILDER CREEK, WHICH FLOWS WEST TO EAST ABOUT 1100 FEET NORTH OF THE SITE. GILDER CREEK FLOWS INTO THE ENOREE RIVER ABOUT EIGHT MILES FURTHER DOWNSTREAM. LAND SURROUNDING THE UNNAMED STREAM IS CURRENTLY UNDEVELOPED.

THE TOPOGRAPHY AT AND NEAR THE SITE CONSISTS OF GENTLY ROLLING HILLS. MUCH OF THE SITE SLOPES TO THE WEST AND NORTHWEST TOWARDS THE STREAM. WEST OF THE STREAM THE LAND RISES STEEPLY. TOPOGRAPHIC ELEVATION RANGES FROM APPROXIMATELY 850 FEET ABOVE MEAN SEA LEVEL (MSL) AT THE SOUTHEASTERN EDGE OF THE SITE TO 775 FEET ABOVE MSL WHERE THE STREAM LEAVES THE SITE TO THE NORTH. THE SOUTHERN PORTION OF THE SITE, INCLUDING THE LAGOON AREA, THE RICE HOME, AND ADJACENT PASTURELAND, HAS BEEN CLEARED WITH ONLY SCATTERED STANDS OF TREES REMAINING. PORTIONS OF THE SITE ARE FORESTED. THE NORTHEAST CORNER HAS BEEN CLEARED OF TREES AND IS COVERED WITH THICK SCRUB VEGETATION. LAGOON NO. 1 IS LOCATED NEAR A RIDGECREST AND DOES NOT RECEIVE AN APPRECIABLE QUANTITY OF SURFACE RUNOFF. LAGOON NO. 4 RECEIVES SOME SURFACE RUNOFF FROM THE SURROUNDING AREA. THE THREE CLOSED LAGOONS (NOS. 2, 3, AND 5) HAVE BEEN BACKFILLED AND ARE COVERED WITH PATCHES OF TALL GRASS. EXCEPT FOR A

LACK OF BRUSH AND TREES AND INTERMITTENT SPOTS OF BARE GROUND, THERE IS LITTLE IN THE WAY OF SURFACE FEATURES TO SUGGEST THE PREVIOUS LIMITS OF THE THREE CLOSED LAGOONS. AN EIGHT-FOOT HIGH CHAIN LINK FENCE WAS CONSTRUCTED BY THE POTENTIAL RESPONSIBLE PARTIES' CONTRACTOR, TO LIMIT

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ACCESS TO THE LAGOON AREA.

SURFACE DRAINAGE AT THE GSST SITE OCCURS BY OVERLAND FLOW AND THROUGH SEVERAL GULLIES LEADING TOWARDS THE UNNAMED STREAM. THE LARGEST OF THE GULLIES ORIGINATES IN THE SOUTHEAST CORNER OF THE SITE AND FOLLOWS THE EASTERN PROPERTY LINE BEFORE TURNING WEST AND INTERSECTING THE UNNAMED STREAM. TWO SMALLER GULLIES ORIGINATE WEST OF THE LAGOON AREA AND TREND TO THE WEST TOWARD THE STREAM. SURFACE WATER FLOW OCCURS IN THESE DRAINAGE GULLIES AFTER PERIODS OF HEAVY PRECIPITATION.

SUBSURFACE FEATURES

THE GSST SITE IS LOCATED IN THE PIEDMONT PHYSIOGRAPHIC PROVINCE OF SOUTH CAROLINA ON THE EASTERN SLOPE OF THE SOUTHERN APPALACHIAN MOUNTAINS. THE FIRST RIDGE OF THE MOUNTAINS OCCURS APPROXIMATELY 20 MILES TO THE NORTH, AND THE MAIN RIDGE OCCURS APPROXIMATELY 50 MILES TO THE NORTH. THE PIEDMONT PROVINCE IS A BROAD PLATEAU RANGING IN ELEVATION FROM 400 TO 1200 FEET ABOVE MEAN SEA LEVEL. THE GENERAL GEOLOGY OF THE AREA CONSISTS OF METAMORPHICS, INTRUDED BY IGNEOUS ROCKS, SUCH AS GRANITES. THE BEDROCK IS OVERLAIN BY RESIDUAL SOIL, SAPROLITE, SLOPE WASH DEPOSITS, AND ALLUVIAL FILL MATERIAL OF VARIABLE THICKNESS.

SPECIFIC GEOLOGIC CONDITIONS AT THE SITE WERE DETERMINED BY VISUAL EXAMINATION OF SOIL SAMPLES AND ROCK CUTTINGS OBSERVED DURING GROUND WATER MONITORING WELL DRILLING. SITE GEOLOGY IS ILLUSTRATED ON THE CROSS-SECTIONS SHOWN ON FIGURES 4, 5 AND 6. RESIDUAL SOILS COMPRISE MOST OF THE LAND SURFACE. THESE SOILS GRADE FROM A SILTY AND SANDY CLAY TO A SILTY AND CLAYEY SAND. THE RESIDUAL SOILS ARE UNDERLAIN BY A SAPROLITE UNIT OVERLYING A METAMORPHIC/IGNEOUS ROCK ASSEMBLAGE. THE SAPROLITE RANGES IN THICKNESS FROM APPROXIMATELY 60 FEET IN THE SOUTHEAST CORNER OF THE SITE TO 5 FEET IN THE CENTER PORTION OF THE SITE NEAR THE INTERSECTION WITH THE UNNAMED STREAM. THE SAPROLITE CONSISTS PRIMARILY OF SILTY SANDS WITH VARYING AMOUNTS OF MICA AND ZONES OF SILT, SILTY AND SANDY CLAY, AND CLAYEY SAND. THE SILTY SAND UNIT GENERALLY CONTAINS INCREASING AMOUNTS OF MICA CONTENT WITH DEPTH. THE SANDS GRADE IN TEXTURE FROM FINE-MEDIUM TO FINE-COARSE WITH SOME ROCK FRAGMENTS.

DEPTH TO BEDROCK VARIES ACROSS THE SITE FROM 10 TO 60 FEET BELOW GROUND SURFACE. BASED ON VISUAL EXAMINATION OF CORE SAMPLES TAKEN FROM BEDROCK MONITORING WELLS, BEDROCK BENEATH THE SITE GENERALLY CONSISTS OF GRANITE GNEISS. PROMINENT MINERALS WERE QUARTZ, FELDSPAR, AND MICA. THE BEDROCK SURFACE WAS FOUND TO BE IRREGULAR ACROSS THE SITE. EAST OF THE UNNAMED STREAM, THE BEDROCK SURFACE GENERALLY SLOPES UPWARD TO THE EAST, AWAY FROM THE STREAM. TO THE WEST OF THE STREAM, THE BEDROCK SURFACE RISES STEEPLY TO THE WEST WITH TOPOGRAPHY.

GROUND WATER FLOW IS TO THE NORTHWEST OVER MOST OF THE SITE, TOWARD THE UNNAMED STREAM, WHICH FLOWS IN A SOUTH TO NORTH DIRECTION. WEST OF THE STREAM, GROUND WATER FLOWS TO THE NORTHEAST TOWARD THE STREAM. BASED ON INFORMATION COLLECTED DURING THE REMEDIAL INVESTIGATION, THE CALCULATED

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VALUES OF GROUND WATER VELOCITY FOR THE SITE RANGE FROM 40 TO 120 FEET PER YEAR.

CURRENT LAND USE

LAND USE TO THE EAST AND WEST OF THE SITE IS RESIDENTIAL. LAND USE TO THE NORTH AND SOUTHEAST OF THE SITE IS PRIMARILY RESIDENTIAL, ALTHOUGH, AT PRESENT, THE AREAS ARE SPARSELY POPULATED. LAND USE TO THE SOUTHWEST OF THE SITE IS PRIMARILY AGRICULTURAL. UNDEVELOPED LAND IS HEAVILY FORESTED, WHILE RESIDENTIAL AND AGRICULTURAL AREAS ARE GENERALLY CLEARED OF TREES.

AN ELEMENTARY SCHOOL IS LOCATED APPROXIMATELY TWO MILES WEST OF THE SITE, AND A MIDDLE SCHOOL IS LOCATED APPROXIMATELY TWO MILES SOUTH OF THE SITE. A CHURCH AND A YMCA FACILITY ARE LOCATED APPROXIMATELY ONE MILE SOUTHWEST OF THE SITE. ANOTHER CHURCH IS LOCATED APPROXIMATELY 1.75 MILES NORTH OF THE SITE.

AT THIS TIME, THERE ARE 203 SINGLE FAMILY RESIDENCES WITHIN A QUARTER-MILE RADIUS OF THE SITE. THE AREAS NORTH AND SOUTH OF THE SITE HAVE THE POTENTIAL FOR ABOUT 60 ADDITIONAL SINGLE FAMILY RESIDENCES. BASED ON THESE FIGURES AND UTILIZING CURRENT ESTIMATING TECHNIQUES, THE CURRENT POPULATION NEAR THE SITE IS 638, AND THE POTENTIAL FUTURE POPULATION IS 826. INFORMATION WAS OBTAINED FROM THE SOUTH CAROLINA WATER RESOURCES COMMISSION TO IDENTIFY POTENTIAL GROUND WATER USERS LOCATED WITHIN A HALF-MILE RADIUS OF THE SITE. RECORDS WERE AVAILABLE FOR ONLY ONE WELL, WHICH IS LOCATED ON THE UPGRADIENT, EASTERN EDGE OF THE SITE. THE WELL WAS REPORTEDLY DRILLED IN 1986 TO A DEPTH OF 410 FEET. PUBLIC WATER IS AVAILABLE FOR USE BY HOMES IN THE SUBDIVISION. THE SOURCE OF THE PUBLIC WATER IS RESERVOIRS LOCATED IN THE NORTHERN PART OF GREENVILLE COUNTY MORE THAN 20 MILES FROM GSST.

#SHEA

SITE HISTORY AND ENFORCEMENT ACTIVITIES

THE GOLDEN STRIP SEPTIC TANK SERVICE WAS A WASTE HAULING AND DISPOSAL COMPANY OPERATED PRIMARILY BY MR. BUCK RICE. THE GSST SERVICE BEGAN ACCEPTING INDUSTRIAL AND SEPTIC WASTES IN 1960. INITIALLY, TWO UNLINED IMPOUNDMENTS (LAGOONS) WERE EXCAVATED AND USED FOR STORAGE OF INDUSTRIAL WASTEWATER AND SLUDGES. THREE ADDITIONAL UNLINED IMPOUNDMENTS WERE LATER CONSTRUCTED. SITE OPERATIONS BY THE GSST SERVICE WERE DISCONTINUED IN 1975. LOCATIONS OF THE IMPOUNDMENTS ARE ILLUSTRATED ON FIGURE 3.

IN JANUARY 1975, THE GOLDEN STRIP SEPTIC TANK SERVICE APPLIED TO THE

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL (SCDHEC) FOR A PERMIT TO COLLECT AND TRANSPORT INDUSTRIAL SOLID WASTE MATERIAL AND DISPOSE OF THAT MATERIAL ON THE RICE PROPERTY. THE TYPE OF WASTE MATERIALS LISTED FOR DISPOSAL ON THE PERMIT APPLICATION WERE LIQUID

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(CHROMIC ACID AND WATER). SCDHEC DENIED THE GSST SERVICE PERMIT APPLICATION IN A LETTER DATED MAY 15, 1975, AND STATED THAT THE PROPOSED METHOD OF HANDLING INDUSTRIAL WASTE AT GSST WAS NOT ACCEPTABLE. SCDHEC FURTHER INDICATED THAT SHOULD GSST DESIRE TO CONTINUE HANDLING AND DISPOSING INDUSTRIAL WASTES, A PROPOSAL SHOULD BE SUBMITTED FOR AN ALTERNATIVE WASTE TREATMENT SYSTEM AND THAT PERMITS FOR THESE ACTIVITIES WOULD BE NECESSARY. THE GSST SERVICE DISCONTINUED COLLECTION, HAULING, AND DISPOSAL OF WASTES IN 1975. IN 1978, THREE OF THE LAGOONS (NOS. 2, 3, AND 5) WERE FILLED BY PUSHING IN THE SURROUNDING BERMS.

INITIAL INVESTIGATIONS

INVESTIGATIONS OF THE GSST SITE BEGAN IN 1972 WHEN SCDHEC SENT FIELD PERSONNEL TO CONDUCT INTERVIEWS WITH MR. RICE AND PERFORM A SITE SURVEY OF THE LAGOONS AND SURROUNDING AREA. SCDHEC CONTINUED TO PERFORM MONITORING OF THE SITE AFTER THE LAGOONS WERE FILLED WITH SOIL AND GRADED IN 1978. ANALYSES OF SAMPLES COLLECTED BY SCDHEC IN 1981 FROM THE WATER IN THE UNCOVERED LAGOONS (NOS. 1 AND 4) INDICATED THE PRESENCE OF HEAVY METALS SUCH AS CHROMIUM, LEAD, AND COPPER IN THIS AREA.

PROMPTED BY THESE RESULTS, THE UNITED STATE ENVIRONMENTAL PROTECTION AGENCY (EPA) PERFORMED A SITE INSPECTION (SI) IN AUGUST 1984 TO GATHER ADDITIONAL INFORMATION ON THE SITE. DURING THE SI, SAMPLES WERE COLLECTED AND ANALYZED FROM THE LAGOON AREAS, ON-SITE SPRINGS, THE UNNAMED STREAM, AND GILDER CREEK. THE RESULTS OF THE SI INDICATED HEAVY METAL CONTAMINATION IN THE LAGOONS AND GROUNDWATER. THE SURFACE WATER DID NOT INDICATE HEAVY METAL CONTAMINATION. RESULTS OF THE SI INDICATED THAT THERE WAS NO IMMEDIATE THREAT OR ENDANGERMENT TO RESIDENTS LIVING NEAR THE SITE.

IN 1986, EPA CONDUCTED FURTHER CONFIRMATION TESTING AT THE SITE AS PART OF THE SI TO DETERMINE IF THE SITE BE CONSIDERED FOR THE SUPERFUND REMEDIAL PROGRAM. THE GOLDEN STRIP SEPTIC TANK SITE RECEIVED A HAZARD RANKING SYSTEM (HRS) SCORE OF 40.3 AND WAS PROPOSED FOR INCLUSION ON THE NATIONAL PRIORITIES LIST (NPL) IN JANUARY 1987. DUE TO THE PRESENCE OF THESE CONSTITUENTS IN PRELIMINARY SAMPLING, AND THE POTENTIAL THREAT TO HUMAN HEALTH AND THE ENVIRONMENT POSED BY THESE CONSTITUENTS, THE GSST SITE WAS PLACED ON THE NPL IN JUNE 1987.

REMEDIAL INVESTIGATION

SEVEN POTENTIALLY RESPONSIBLE PARTIES (PRPS) ENTERED INTO AN ADMINISTRATIVE ORDER ON CONSENT (AOC) WITH EPA TO PERFORM THE REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) AT THE SITE UNDER THE DIRECTION AND OVERSIGHT OF EPA. THE OBJECTIVE OF THE RI/FS AS STATED IN THE AOC WAS "...TO DETERMINE THE NATURE AND EXTENT OF THE THREAT TO PUBLIC

HEALTH OR WELFARE, OR THE ENVIRONMENT CAUSED BY THE RELEASE OR
THREATENED RELEASE OF HAZARDOUS SUBSTANCES FROM THE SITE." ON JULY 22,
1988, METAL PRODUCTS CORP.; STERLING DRUG, INC.; COLONIAL HEIGHTS
PACKAGING, INC.; E-SYSTEMS, INC.; AND W.R. GRACE & CO.-CONN. SIGNED THE

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AOC. ON JANUARY 12, 1989, THE AOC WAS MODIFIED TO INCLUDE BASF
CORPORATION AND THE CAROLINA PLATING AND STAMPING CORPORATION AS PARTIES
TO THE AOC. THESE SEVEN PRPS ARE KNOWN AS THE GOLDEN STRIP TASK GROUP.

THE GOLDEN STRIP TASK GROUP RETAINED RMT, INC. OF GREENVILLE, SOUTH
CAROLINA AS THEIR CONTRACTOR TO PERFORM THE REMEDIAL INVESTIGATION. THE
MAJORITY OF RI FIELD ACTIVITIES WERE CONDUCTED FROM SEPTEMBER 1989 TO
MARCH 1990. THE INVESTIGATION INCLUDED THE COLLECTION OF 226
ENVIRONMENTAL SAMPLES. THE MEDIA SAMPLED INCLUDED VISIBLE LAGOON WASTE,
SOIL, AIR, GROUND WATER, AND SURFACE WATER SAMPLES FROM SELECTED
LOCATIONS ACROSS THE SITE. SEVENTEEN GROUND WATER MONITORING WELLS WERE
INSTALLED AND SAMPLED. THE UNNAMED STREAM WAS ALSO SAMPLED FOR WATER
AND SEDIMENTS. THE DRAFT REMEDIAL INVESTIGATION REPORT WAS PREPARED AND
SUBMITTED TO THE EPA AND SCDHEC IN NOVEMBER 1990. THE RI REPORT WAS
GIVEN FINAL APPROVAL BY EPA AND SCDHEC ON JUNE 10, 1991. THE PRINCIPAL
RESULTS AND FINDINGS OF THE REMEDIAL INVESTIGATION ARE DISCUSSED IN
FURTHER DETAIL IN SECTION 5.0 - SUMMARY OF SITE CHARACTERISTICS, OF THIS
DOCUMENT.

SUPPLEMENTAL REMEDIAL INVESTIGATION

A SUPPLEMENTAL GROUND WATER INVESTIGATION WAS CONDUCTED TO FURTHER
DEFINE THE NATURE AND EXTENT OF GROUND WATER CONTAMINATION PRESENT AT
THE SITE. THE OBJECTIVE OF THE SUPPLEMENTAL REMEDIAL INVESTIGATION
(SRI) WAS TO FURTHER INVESTIGATE GROUND WATER FLOW CHARACTERISTICS AND
QUALITY IN THE DOWNGRAIDENT, NORTHERN PORTION OF THE SITE.
SPECIFICALLY, MUCH OF THE WORK FOCUSED ON DETERMINING IF A GROUND WATER
PLUME HAD ESCAPED DETECTION BY THE MONITORING WELL NETWORK PREVIOUSLY
INSTALLED DURING THE INITIAL RI. SRI FIELD ACTIVITIES BEGAN IN FEBRUARY
1991 AND CONCLUDED IN MID-MARCH 1991.

FIVE ADDITIONAL GROUND WATER MONITORING WELLS WERE INSTALLED
DOWNGRAIDENT FROM THE EXISTING NETWORK OF MONITORING WELLS. GROUND
WATER SAMPLES WERE COLLECTED AND ANALYZED FROM THESE FIVE NEW WELLS.
THE NETWORK OF EXISTING WELLS IN THE VICINITY OF THE LAGOON AREAS WERE
ALSO RESAMPLED AND ANALYZED IN ORDER TO CONFIRM PREVIOUS SAMPLE RESULTS.
THE DRAFT SRI REPORT WAS SUBMITTED TO EPA AND SCDHEC ON MAY 1, 1991.
THE SRI REPORT WAS GIVEN FINAL APPROVAL BY EPA AND SCDHEC ON JULY 8,
1991. THE PRINCIPAL RESULTS AND FINDINGS OF THE SRI ARE DISCUSSED IN
FURTHER DETAIL IN SECTION 5.0 - SUMMARY OF SITE CHARACTERISTICS OF THIS
DOCUMENT.

#HCP
HIGHLIGHTS OF COMMUNITY PARTICIPATION

IN ACCORDANCE WITH PUBLIC PARTICIPATION REQUIREMENTS OF CERCLA SECTIONS 113(K)(2)(B)(I-V) AND 117, A COMPREHENSIVE COMMUNITY RELATIONS PROGRAM WAS DEVELOPED AND IMPLEMENTED THROUGHOUT THE REMEDIAL PROCESS AT THE GOLDEN STRIP SEPTIC TANK SITE.

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IN JULY 1989, A REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) KICK-OFF FACT SHEET WAS PREPARED AND DELIVERED TO INTERESTED CITIZENS AND LOCAL OFFICIALS INCLUDED ON THE SITE'S MAILING LIST. THIS FACT SHEET EXPLAINED THE OVERALL PROCESS OF SUPERFUND, THE UPCOMING RI/FS AT THE GSST SITE, AND OPPORTUNITIES FOR COMMUNITY INVOLVEMENT. A RI/FS KICK-OFF PUBLIC MEETING WAS HELD ON SEPTEMBER 12, 1989 WITH THE HOLLY TREE HOMEOWNERS ASSOCIATION TO PRESENT THE OBJECTIVES OF THE INVESTIGATION, DESCRIBE THE ACTIVITIES THAT WERE TO TAKE PLACE AS PART OF THE INVESTIGATION, AND TO ANSWER ANY QUESTIONS THE PUBLIC HAD REGARDING THE UPCOMING INVESTIGATION.

FOLLOWING THE COMPLETION OF THE RI IN FEBRUARY 1991, A RI/FS FINDINGS FACT SHEET WAS PREPARED AND RELEASED TO THE PUBLIC IN MARCH 1991. THIS FACT SHEET PRESENTED THE FINDINGS OF THE INVESTIGATION AND PROVIDED A EXPLANATION OF THE FEASIBILITY STUDY. FINDINGS OF THE BASELINE RISK ASSESSMENT WERE DISCUSSED AS WELL AS THE FUTURE DIRECTION OF THE SITE.

THE FINALIZED RI/FS REPORTS AND PROPOSED PLAN FOR THE GSST SITE WERE RELEASED TO THE PUBLIC ON JUNE 17, 1991. THESE DOCUMENTS WERE MADE AVAILABLE FOR PUBLIC REVIEW AT THE EPA REGION IV RECORDS CENTER, THE GREENVILLE PUBLIC LIBRARY, AND THE SIMPSONVILLE BRANCH LIBRARY. THE NOTICE OF AVAILABILITY OF THESE DOCUMENTS AND NOTIFICATION OF THE PROPOSED PLAN PUBLIC MEETING WAS ANNOUNCED IN THE GOLDEN STRIP TIMES AND THE SIMPSONVILLE TRIBUNE-TIMES ON JUNE 12 AND JUNE 19, 1991 AND IN THE GREENVILLE NEWS ON JUNE 16, 1991. THE PROPOSED PLAN PUBLIC MEETING WAS HELD ON JUNE 20, 1991 AT THE SIMPSONVILLE COMMUNITY BUILDING. AT THIS MEETING, REPRESENTATIVES FROM EPA AND SCDHEC PRESENTED EPA'S PREFERRED ALTERNATIVE FOR CLEANUP OF THE SITE AND ANSWERED ANY QUESTIONS THE PUBLIC HAD REGARDING THE PREFERRED ALTERNATIVE, OTHER ALTERNATIVES CONSIDERED IN THE FS OR ANY OTHER CONCERNS THE PUBLIC HAD RELATED TO THE CLEANUP OF THIS SITE.

THE MANDATORY 30-DAY PUBLIC COMMENT PERIOD WAS HELD FROM JUNE 17 TO JULY 18, 1991. A RESPONSE TO THE COMMENTS RECEIVED DURING THIS COMMENT PERIOD IS INCLUDED IN THE RESPONSIVENESS SUMMARY, WHICH IS PART OF THIS RECORD OF DECISION. THIS DECISION DOCUMENT PRESENTS THE SELECTED REMEDIAL ACTION FOR THE GOLDEN STRIP SEPTIC TANK SITE IN SIMPSONVILLE, SOUTH CAROLINA, CHOSEN IN ACCORDANCE WITH CERCLA, AS AMENDED BY SARA, AND, TO THE EXTENT PRACTICABLE, THE NATIONAL CONTINGENCY PLAN. THE DECISION FOR THIS SITE IS BASED ON THE ADMINISTRATIVE RECORD FOR THIS SITE.

#SRRA
SCOPE AND ROLE OF RESPONSE ACTION

EPA HAS IDENTIFIED THE FOLLOWING REMEDIAL ACTION OBJECTIVES FOR THE
CLEANUP OF THE GOLDEN STRIP SEPTIC TANK SITE:

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CONTAMINATED SURFACE SOILS/LAGOON SLUDGES

THE SELECTED REMEDY IN THIS ROD WILL ADDRESS THE CONTAMINATED SOILS AND LAGOON SLUDGE AT THE SITE THAT POSE THE PRINCIPAL THREAT TO HUMAN HEALTH AND THE ENVIRONMENT. THE PRIMARY EXPOSURE THREAT TO HUMAN HEALTH FOR THIS CONTAMINATED MATERIAL INCLUDES DERMAL CONTACT WITH THE WASTE CONSTITUENTS IN EACH OF THE INACTIVE LAGOONS, AND DERMAL CONTACT WITH WASTE CONSTITUENTS LOCATED IN THE SURFACE SOILS IN THE IMMEDIATE VICINITY OF THE LAGOONS. THE CONTAMINATED SOIL AND LAGOON SLUDGES HAVE BEEN IDENTIFIED AS CONSTITUENT SOURCE AREAS AND, AS SUCH, REPRESENT THE PRIMARY THREAT POSED TO THE ENVIRONMENT. THE ESTIMATED VOLUME OF AFFECTED SOIL AND LAGOON WASTE REQUIRING REMEDIAL ACTION IS APPROXIMATELY 28,000 CUBIC YARDS.

GROUND WATER

THE GROUND WATER RESULTS FROM THE RI AND SRI REPORT INDICATE THAT LIMITED MIGRATION OF WASTE CONSTITUENTS FROM THE IDENTIFIED SOURCE AREAS HAS OCCURRED. BASED ON THE THREE ROUNDS OF GROUND WATER SAMPLING EVENTS, THE EFFECT ON GROUND WATER HAS BEEN MINIMAL EVEN THOUGH THE WASTES HAVE BEEN SUBJECT TO INFILTRATION FOR MORE THAN 15 YEARS. INTERMITTENT EXCEEDANCES OF MAXIMUM CONCENTRATION LEVELS (MCLS), ESTABLISHED BY THE SAFE DRINKING WATER ACT, WERE DETECTED IN THE GROUND WATER AT THE SITE IN A RELATIVELY LOCALIZED AREA IN THE IMMEDIATE VICINITY OF THE LAGOONS. HOWEVER, EPA BELIEVES THAT ACTIVE REMEDIATION OF GROUND WATER (SUCH AS A GROUND WATER PUMP AND TREAT SYSTEM) IN THE VICINITY OF THE LAGOONS IS NOT REASONABLE OR TECHNICALLY PRACTICABLE FOR THE FOLLOWING REASONS:

1) NO DISCERNIBLE PLUME - ANALYTICAL RESULTS OF GROUND WATER SAMPLES COLLECTED FROM THE MONITORING WELLS IN THE IMMEDIATE VICINITY OF THE LAGOONS INDICATE THAT THERE IS NO APPARENT PATTERN OF CONSTITUENT CONCENTRATION IN THE GROUND WATER. THE AREAL EXTENT OF THE AFFECTED GROUND WATER IS RELATIVELY LOCALIZED TO THE IMMEDIATE VICINITY OF THE LAGOONS. GROUND WATER QUALITY WITHIN THE BEDROCK WAS NOT OBSERVED TO BE AFFECTED BY PAST WASTE DISPOSAL ACTIVITIES ON-SITE. THE AREAL EXTENT OF THE AFFECTED GROUND WATER IS EXPECTED TO DECREASE AS A RESULT OF THE SELECTED REMEDY IN THIS DOCUMENT.

2) THERE ARE KNOWN AND PROJECTED POINTS OF ENTRY OF SITE GROUNDWATER INTO SURFACE WATER - INFORMATION GATHERED DURING THE RI INDICATE THAT GROUND WATER WITHIN THE SAPROLITE DOWNGRAIENT OF THE LAGOONS TENDS TO DISCHARGE ON-SITE TO THE UNNAMED TRIBUTARY OF GILDER CREEK.

3) ON THE BASIS OF MEASUREMENTS, THERE IS NO STATISTICALLY SIGNIFICANT INCREASE OF WASTE CONSTITUENTS FROM SITE GROUND WATER IN SURFACE WATER

AT THE POINT OF ENTRY - WATER SAMPLES TAKEN FROM FIVE LOCATIONS IN THE UNNAMED STREAM INDICATE THERE IS NO INCREASE IN CONSTITUENT CONCENTRATIONS OVER SURFACE WATER BACKGROUND CONCENTRATIONS.

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4) THE SELECTED REMEDY INCLUDES ENFORCEABLE MEASURES THAT WILL PRECLUDE HUMAN EXPOSURE TO THE CONTAMINATED GROUND WATER - INSTITUTIONAL CONTROLS AND A CONSERVATION EASEMENT, OR DEED RESTRICTION, SHALL BE ESTABLISHED TO PROVIDE RELIABLE CONTROL AGAINST FUTURE USE OF THE AFFECTED GROUND WATER UNTIL CONSTITUENT CONCENTRATIONS ARE NO LONGER ELEVATED ABOVE ACCEPTABLE LIMITS.

5) THE SELECTED REMEDY WHICH ADDRESSES THE SOURCE MATERIAL WILL RESULT IN A POSITIVE INFLUENCE ON GROUND WATER - THE SELECTED REMEDY TO CONTROL CONSTITUENT PATHWAYS TO HUMAN EXPOSURE AND THE ENVIRONMENT WILL RESULT IN DECREASES OF CONSTITUENT CONCENTRATIONS OVER TIME. CHEMICAL DEGRADATION, DILUTION AND SORPTION TO SOIL PARTICLES IN THE AQUIFER SHOULD BE SUFFICIENT TO NATURALLY ATTENUATE CONSTITUENT CONCENTRATIONS WITHOUT IMPACTING HEALTH AND THE ENVIRONMENT IN A RELATIVELY SHORT TIME-FRAME OF TWO TO FIVE YEARS AFTER SOURCE REMEDIATION OCCURS.

BASED ON THE ABOVE CONCLUSIONS, ALTERNATE CONCENTRATION LIMITS (ACLS) WILL BE ESTABLISHED, AS PART OF THIS ROD, FOR THOSE CONSTITUENTS WHICH EXCEEDED MCLS DURING THE THREE GROUND WATER SAMPLING EVENTS. THESE CONSTITUENTS ARE 1,2-DICHLOROETHANE, 1,2-DICHLOROPROPANE, CHROMIUM, AND LEAD. ADDITIONALLY, THIS RESPONSE ACTION WILL ALSO INCLUDE A COMPREHENSIVE LONG-TERM MONITORING PROGRAM UTILIZING THE EXISTING MONITORING WELL NETWORK. LONG-TERM MONITORING OF THE GROUND WATER WILL PROVIDE A SUFFICIENT DATABASE FOR EVALUATING THE REPRESENTATIVE CONCENTRATIONS OF CONSTITUENTS IN GROUND WATER. PERIODIC ASSESSMENT OF GROUND WATER QUALITY COULD RESULT IN THE NEED TO EVALUATE ADDITIONAL REMEDIAL ACTION FOR GROUND WATER AT THE SITE.

LAGOON SURFACE WATER

SURFACE WATER CONTAINED IN OPEN LAGOON NOS. 1 AND 4 WILL ALSO BE ADDRESSED BY THIS DOCUMENT. WATER IMPOUNDED IN THESE LAGOONS EXCEEDED MCLS FOR CADMIUM AND CHROMIUM. THE SELECTED REMEDY WILL INCLUDE COLLECTION AND DISCHARGE OF SURFACE WATER IMPOUNDED IN THESE LAGOONS TO THE LOCAL PUBLICLY OWNED TREATMENT WORKS (POTW). PRETREATMENT OF THE DISCHARGE MAY BE REQUIRED IF CONSTITUENT CONCENTRATIONS EXCEED THE LOCAL AUTHORITY'S EFFLUENT STANDARDS. RI DATA INDICATE PRETREATMENT WILL NOT BE REQUIRED. THE ESTIMATED VOLUME OF SURFACE WATER IMPOUNDED IN THE LAGOONS IS APPROXIMATELY 1.9 MILLION GALLONS.

#SSC

SUMMARY OF SITE CHARACTERISTICS

THIS SECTION OF THE RECORD OF DECISION SUMMARIZES THE RESULTS OF THE SITE FIELD INVESTIGATIONS WHICH WERE CONDUCTED AS PART OF THE REMEDIAL

INVESTIGATION AND THE SUPPLEMENTAL REMEDIAL INVESTIGATION. THE SAMPLING PLAN FOR THE GSST SITE WAS BASED ON THE REPORTED METHOD OF WASTE DISPOSAL, TOPOGRAPHIC DRAINAGE CHARACTERISTICS, AND RESULTS OF PREVIOUS REGULATORY SITE INVESTIGATIONS. THE TYPES OF SAMPLES COLLECTED WERE

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LAGOON AND DRUM WASTES, SUBSURFACE SOILS BELOW AND ADJACENT TO THE LAGOONS, SURFACE SOILS, GROUND WATER, SURFACE WATER, STREAM SEDIMENTS, AND AIR. AREAS IDENTIFIED AS POTENTIAL CONSTITUENT SOURCES INCLUDED THE LAGOON AREA, POTENTIAL LAND FARMING AREAS, THE ABANDONED DRUM AREA, AND A TRUCK TURNAROUND AREA.

THE AREA IN THE IMMEDIATE VICINITY OF THE LAGOONS WAS DESIGNATED AS ZONE 1. THE ZONE 1 BOUNDARY IS SHOWN ON FIGURE 3. ANALYTICAL TESTING WAS PERFORMED ON ZONE 1 SAMPLES FOR PARAMETERS ON BOTH THE TARGET COMPOUND LIST (TCL) AND THE TARGET ANALYTE LIST (TAL), AS WELL AS CYANIDE AMENABLE TO CHLORINATION. ZONE 2 SAMPLING INCLUDED THE REMAINING AREAS OF THE SITE. A MODIFIED LIST OF ANALYTICAL PARAMETERS WAS DEVELOPED FOR ZONE 2 SAMPLING BASED ON SEVERAL FACTORS, INCLUDING:

- * THE CONCENTRATION OF THE CONSTITUENTS IN THE ZONE 1 SAMPLES;
- * THE RELATIONSHIP OF THE DETECTED CONSTITUENTS TO THE WASTE MATERIAL ANALYSES AND BACKGROUND SAMPLE DATA;
- * CONSTITUENT CONCENTRATIONS RELATIVE TO APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS;
- * THE POTENTIAL TOXICITY OR ENDANGERMENT TO HUMAN HEALTH AND THE ENVIRONMENT; AND
- * POTENTIAL MOBILITY.

TABLE 1 SUMMARIZES THE COMPOUNDS THAT WERE DETECTED IN THE VARIOUS MEDIA DURING THE COURSE OF THE RI. THE RANGES OF CONCENTRATIONS FOR EACH COMPOUND ARE LISTED IN TABLE 2.

UPGRADIENT, OR BACKGROUND SAMPLES, WERE COLLECTED IN AREAS WHICH WERE THOUGHT NOT TO HAVE BEEN AFFECTED BY PAST WASTE DISPOSAL ACTIVITIES ON-SITE. THESE SAMPLES WERE ANALYZED FOR THE TAL, TCL, AND FREE CYANIDE AND WERE USED FOR COMPARISON AGAINST SAMPLES COLLECTED IN ZONE 1 AND 2. TABLE 3 SUMMARIZES ANALYTICAL RESULTS FOR INORGANIC PARAMETERS FROM THE UPGRADIENT SAMPLES FOR THE VARIOUS MEDIA. INCLUDED IN THIS TABLE IS THE RANGE OF SELECTED INORGANIC COMPOUNDS DETECTED IN SOILS IN GEORGIA, SOUTH CAROLINA, AND NORTH CAROLINA OBTAINED FROM "CHEMICAL ANALYSES OF SOILS AND OTHER SURFICIAL MATERIALS OF THE CONTERMINOUS UNITED STATES" (BOERNGREN AND SHACKLETTE, 1981). THE RANGE OF CONCENTRATIONS IN TABLE 3 INCLUDES SAMPLES COLLECTED FROM FOOTHILL, PIEDMONT, AND COASTAL PLAIN LOCATIONS, AND IS PRESENTED FOR COMPARISON WITH DOWNGRADIENT SAMPLES.

UPON COMPARISON OF TABLE 2 AND 3, COMMON INORGANIC CONSTITUENTS

PERCEIVED NOT TO BE RELATED TO WASTE DISPOSAL ACTIVITIES AT THE SITE ARE: ALUMINUM, BARIUM, BERYLLIUM, CALCIUM, COBALT, IRON, MAGNESIUM, MANGANESE, POTASSIUM, SELENIUM, SILVER, SODIUM AND VANADIUM. THE CONCENTRATION RANGES OF THESE COMPOUNDS, AS SUMMARIZED IN TABLE 2,

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PRIMARILY CORRESPOND WITH THE LOCAL AND REGIONAL BACKGROUND LEVELS.
SOURCE AREAS

CONSTITUENTS TO BE ADDRESSED DURING THE REMEDIAL INVESTIGATION WERE IDENTIFIED BY LOCATING AND SAMPLING THE PRIMARY AREAS OF WASTE DEPOSITION. AVAILABLE RECORDS INDICATE THAT THE FIVE LAGOONS HAD RECEIVED INDUSTRIAL WASTEWATER AND SLUDGES. SOIL BORINGS AND TEST PITS WERE USED TO INVESTIGATE THE HORIZONTAL AND VERTICAL EXTENT OF WASTE DEPOSITION WITHIN THE FIVE LAGOONS. SAMPLES OF WASTE WERE ANALYZED FOR THE TAL/TCL PARAMETERS TO PROVIDE A CHARACTERIZATION OF THE WASTE MATERIALS. THE LAGOON SLUDGES, UNDERLYING SEDIMENTS, AND AFFECTED SURFACE SOILS WERE IDENTIFIED AS THE PRIMARY SOURCES OF CONSTITUENTS OF CONCERN (COCS) AT THE GSST SITE.

THERE WERE UNCONFIRMED REPORTS OF LAND FARMING AT THREE AREAS ON-SITE. THE LOCATION OF THESE AREAS ARE ILLUSTRATED ON FIGURE 2. SURFACE SOIL SAMPLES WERE COLLECTED AND ANALYZED TO INVESTIGATE THE NATURE OF SOILS IN THESE AREAS. DURING FIELD RECONNAISSANCE WORK FOR THE RI, AN AREA REPORTED TO HAVE BEEN USED AS A TRUCK TURNAROUND AREA WAS IDENTIFIED. LOCATION OF THE TRUCK TURNAROUND AREA IS SHOWN ON FIGURE 2. SURFACE SOIL SAMPLES WERE COLLECTED IN THIS AREA AS PART OF THE COC SOURCE INVESTIGATION.

DURING THE FIELD PORTION OF THE RI, AN AREA CONTAINING TWENTY-SEVEN ABANDONED DRUMS WAS DISCOVERED. ALL BUT FIVE OF THESE DRUMS WERE EMPTY. WHAT APPEARED TO BE RAINWATER ACCUMULATION WAS NOTED IN FOUR DRUMS. ONE DRUM CONTAINED A HARDENED RESIDUE OF UNKNOWN COMPOSITION. AN INVESTIGATION OF THIS AREA WAS CONDUCTED WHICH INCLUDED COLLECTING SURFACE SOIL, WATER, AND WASTE SAMPLES TO ASSESS THE IMPACT OF THE DRUMS AND THEIR CONTENTS ON THE SURROUNDING AREA. LOCATION OF THE ABANDONED DRUM AREA IS SHOWN ON FIGURE 2.

ADDITIONAL SUBSURFACE SAMPLES FROM LAGOON 2 AND SLUDGE SAMPLES FROM LAGOONS 1 AND 4 WERE ALSO COLLECTED. THESE SAMPLES WERE SUBJECTED TO A NUMBER OF ANALYTICAL PROCEDURES TO FURTHER CHARACTERIZE THE WASTE PRESENT AT THE SITE.

LAGOON AREAS

SUBSURFACE WASTE AND SOIL SAMPLES WERE COLLECTED FROM WITHIN LAGOONS 1 THROUGH 5. SURFACE SOIL SAMPLES WERE COLLECTED FROM THE AREAS IMMEDIATELY ADJACENT TO THE LAGOONS. THE LATERAL EXTENT OF THE CLOSED LAGOONS, WHEN ACTIVE, WAS ESTIMATED BY TEST PIT EXCAVATION.

LAGOON 1

FIVE SOIL BORINGS WERE DRILLED, FOUR LAGOON BOTTOM SAMPLES AND ONE SURFACE SOIL SAMPLE WERE COLLECTED TO INVESTIGATE THE HORIZONTAL AND VERTICAL EXTENT OF THE AREAS OF WASTE DEPOSITION IN LAGOON 1. BORING AND SAMPLE LOCATIONS ARE SHOWN ON FIGURES 2 AND 3. THE ESTIMATED

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CONFIGURATION OF THE LAGOON BOTTOM IS INDICATED ON WASTE CROSS SECTIONS E-E' AND I-I' ON FIGURES 7 AND 8. LAGOON 1 IS DEEPEST ALONG ITS WESTERN EDGE AND IS MORE SHALLOW AT THE CENTER. WASTE, IN THE FORM OF A DARK-COLORED SLUDGE MATERIAL, WAS ENCOUNTERED IN A LAYER APPROXIMATELY THREE INCHES THICK ON THE LAGOON BOTTOM.

SEVERAL VOLATILE ORGANIC COMPOUNDS (VOCs) WERE DETECTED AT LOW CONCENTRATIONS IN THE LAGOON BOTTOM SAMPLES. ACETONE WAS DETECTED IN SAMPLES COLLECTED FROM THE FOUR LOCATIONS AT CONCENTRATIONS OF LESS THAN 1 PART PER MILLION (PPM). THREE OF THE LAGOON BOTTOM SAMPLES ALSO CONTAINED 2-BUTANONE, CHLOROBENZENE, TOLUENE, BIS(2-ETHYLHEXYL)PHTHALATE AND XYLENES. ADDITIONAL VOCs DETECTED IN THE FOURTH SAMPLE INCLUDE BENZENE, 1,2-DICHLOROETHENE (TOTAL), ETHYLBENZENE, AND TETRACHLOROETHENE.

THE INORGANIC CONSTITUENTS ANTIMONY, ARSENIC, CADMIUM, CHROMIUM, COPPER, LEAD, MERCURY, NICKEL, ZINC, AND CYANIDE WERE FOUND AT HIGHLY ELEVATED LEVELS COMPARED TO BACKGROUND LEVELS IN TABLE 3. THE HIGHEST CONCENTRATIONS OF HEAVY METALS WERE FOUND IN SAMPLE W01. THIS IS MOST LIKELY RELATED TO THE CLOSE PROXIMITY OF THE SAMPLE LOCATION TO A DISCHARGE AREA USED DURING PAST GSST SERVICE ACTIVITIES AT THE NORTHERN CORNER OF LAGOON 1, AND TO THE INCREASED DEPTH OF THE LAGOON IN THE AREA OF W01.

LAGOON 2

THREE SOIL BORINGS WERE DRILLED AND ONE SURFACE SOIL SAMPLE WAS COLLECTED TO INVESTIGATE THE LAGOON 2 AREA. WASTE WAS ENCOUNTERED DURING THE DRILLING OF SB-7 AND SB-8A. WASTE CROSS SECTIONS E-E' AND G-G' ON FIGURES 7 AND 8 ILLUSTRATE THE DEPTHS AND EXTENT TO WHICH WASTE WAS ENCOUNTERED. THE AREAL EXTENT OF THE WASTE WAS INFERRED FROM THE RESULTS OF TEST PITS TP-1 THROUGH TP-11.

SAMPLES OF THE WASTE AND THE UNDERLYING SOIL WERE COLLECTED FROM BORINGS SB-7 AND SB-8A. XYLENES, TOLUENE, TETRACHLOROETHENE, AND BIS(2-ETHYLHEXYL)PHTHALATE WERE THE MOST COMMON VOCs DETECTED. A WIDE RANGE OF SEMI-VOLATILE ORGANIC COMPOUNDS WERE DETECTED IN WASTE SAMPLES FROM LAGOON 2. THE HIGHEST OF THESE CONCENTRATIONS INCLUDE 1,4-DICHLOROBENZENE AT 6.2 PPM AND 2-CHLOROPHENOL AT 3.7 PPM. MANY OF THESE COMPOUNDS (1,3-DICHLOROBENZENE, 2,4 DIMETHYLPHENOL, 2-METHYLNAPHTHALENE, 4-METHYL-2 PENTANONE, 4-METHYLPHENOL, AND NAPHTHALENE) WERE NOT DETECTED AT ANY OTHER LOCATION ON THE SITE. THE SAMPLES OF WASTE FROM LAGOON 2 CONTAINED ELEVATED CONCENTRATIONS OF SEVERAL INORGANIC CONSTITUENTS. IN GENERAL, THE UNDERLYING SOILS CONTAINED LOWER LEVELS OF INORGANICS; HOWEVER, MANY OF THE LEVELS REMAINED GREATER THAN BACKGROUND.

LAGOON 3

SIX SOIL BORINGS WERE DRILLED TO INVESTIGATE THE LAGOON 3 AREA. WASTE

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WAS NOT ENCOUNTERED IN ANY OF THE BORINGS, BUT WAS SUSPECTED IN ONE. THE AREAL EXTENT OF LAGOON 3 WAS ESTIMATED FROM THE DISTRIBUTION OF WASTE OBSERVED DURING THE EXCAVATION OF TEST PITS TP-23 THROUGH TP-26 (FIGURE 3). THE TEST PITS INDICATE THAT THE WASTE IN LAGOON 3 IS LESS THAN 0.5 FEET THICK, AND CONSISTS OF A LAYER OF DARK, SLUDGE-LIKE MATERIAL THAT CAN BE TRACED IN THE SUBSURFACE. THE ESTIMATED DISTRIBUTION OF THE WASTE IS ILLUSTRATED ON WASTE CROSS-SECTION E-E' AND F-F' (FIGURE 7).

COMPOSITE SAMPLES COLLECTED FROM THE SOIL BORINGS INDICATED THE PRESENCE OF BIS(2-ETHYLHEXYL)PHTHALATE AND TRACE LEVELS OF ACETONE AND CARBON DISULFIDE. THE INORGANIC CONSTITUENTS ANTIMONY, CADMIUM, CHROMIUM, AND COPPER, WERE DETECTED AT ELEVATED LEVELS EXCEEDING BACKGROUND CONCENTRATIONS.

SURFACE SOIL SAMPLES WERE COLLECTED NEAR THE WESTERN EDGE OF LAGOON 3. THESE AREAS ARE CONSIDERED TO HAVE POTENTIAL TO ACT AS SECONDARY SOURCES DUE TO OVERFLOW AND/OR SPILLS FROM LAGOON 3. THE MOST COMMON VOCs DETECTED WERE BIS(2-ETHYLHEXYL)PHTHALATE AND 1,1,1-TRICHLOROETHANE. SEVERAL INORGANIC CONSTITUENTS SUCH AS CADMIUM, CHROMIUM, COPPER, LEAD, ZINC AND CYANIDE WERE ALSO DETECTED AT ELEVATED LEVELS.

LAGOON 4

SAMPLES COLLECTED FROM THE SOIL BORINGS, LAGOON BOTTOM, AND SURFACE SOILS WERE USED TO CHARACTERIZE THE NATURE AND EXTENT OF WASTE IN AND AROUND LAGOON 4. WASTE CROSS-SECTION F-F', H-H' AND D-D' (FIGURES 7 AND 8) ILLUSTRATE THE APPROXIMATE SIZE AND DEPTH OF THE LAGOON AND THE SAMPLE INTERVALS. LAGOON 4 WAS FOUND TO BE DEEPER AND LESS IRREGULAR THAN LAGOON 1. SAMPLES OF THE LAGOON BOTTOM WERE FOUND TO CONSIST OF A DARK, SLUDGE-LIKE MATERIAL CHARACTERIZED AS WASTE.

THE LAGOON BOTTOM SAMPLES CONTAINED A WIDESPREAD GROUP OF ORGANIC COMPOUNDS AT LOW CONCENTRATIONS. THE HIGHEST CONCENTRATION OF AN ORGANIC COMPOUND WAS BIS(2-ETHYLHEXYL)PHTHALATE AT 4.6 PPM. TYPICAL INORGANIC WASTE CONSTITUENTS INCLUDED ARSENIC, ANTIMONY, CADMIUM, CHROMIUM AND CYANIDE.

SURFACE SOIL SAMPLES WERE COLLECTED TO ASSESS THE POTENTIAL FOR THESE AREAS TO SERVE AS SECONDARY SOURCES DUE TO LAGOON OPERATIONS. SEVERAL ORGANIC COMPOUNDS WERE DETECTED AT LEVELS BELOW 0.1 PPM. CHROMIUM, CADMIUM, AND COPPER WERE THE MOST COMMON INORGANIC CONSTITUENTS FOUND AT CONCENTRATIONS GREATER THAN BACKGROUND LEVELS.

LAGOON 5

FOUR SOIL BORINGS WERE DRILLED TO SAMPLE AND CHARACTERIZE WASTE IN LAGOON 5. WASTE WAS ENCOUNTERED AT ONLY TWO SOIL BORINGS. THE ESTIMATED EXTENT OF WASTE IN LAGOON 5 IS ILLUSTRATED ON WASTE CROSS-SECTIONS G-G' AND H-H' (FIGURE 8). THE AREAL EXTENT OF LAGOON 5,

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AS SHOWN ON FIGURE 3 WAS BASED ON VISUAL OBSERVATION OF TEST PITS TP-12 THROUGH TP-22. THE WASTE WAS CHARACTERIZED AS A THIN (LESS THAN 0.5 FEET) LAYER OF DARK, GRAY FINELY LAYERED, SILTY AND SLUDGE-LIKE MATERIAL.

TWO SAMPLES OF THE WASTE WERE COLLECTED AT DEPTHS OF 0 TO 2 FEET AND 4.5 FEET TO 5.0 FEET BELOW GROUND SURFACE. ANALYTICAL RESULTS OF THESE SAMPLES INDICATED THE PRESENCE OF BIS(2-ETHYLHEXYL)PHTHALATE AT A CONCENTRATION OF 3.9 PPM. ELEVEN INORGANIC CONSTITUENTS WERE DETECTED AT CONCENTRATIONS EXCEEDING THE BACKGROUND LEVELS FOR THE SITE. THE MOST COMMON INORGANIC CONSTITUENTS WERE CHROMIUM, COPPER AND ZINC.

ADDITIONAL WASTE CHARACTERIZATION

ADDITIONAL SAMPLING WAS PERFORMED IN ORDER TO FURTHER CHARACTERIZE THE WASTE MATERIALS AND SLUDGES CONTAINED IN THE LAGOONS. TWO SAMPLES WERE COLLECTED FROM THE OPEN AND CLOSED LAGOONS TO ASSESS THE TENDENCY OF VOLATILE ORGANIC COMPOUNDS, METALS, AND CYANIDE TO LEACH FROM THESE WASTES. SAMPLE W07 IS A COMPOSITE SAMPLE OF WASTES TAKEN FROM LAGOON NOS. 1 AND 4. SAMPLE W08 IS A COMPOSITE SAMPLE OF SOIL COLLECTED FROM BELOW THE VISIBLE WASTE LAYER OF LAGOON 2.

EACH SAMPLE WAS ANALYZED FOR TOTAL AND HEXAVALENT CHROMIUM. THE TOXICITY CHARACTERISTIC LEACHATE PROCEDURE (TCLP) ZERO HEADSPACE AND METALS EXTRACTIONS WERE PERFORMED, FOLLOWED BY ANALYSIS OF THE EXTRACTS, TO EVALUATE THE LEACHING POTENTIAL OF VOLATILE ORGANIC COMPOUNDS AND METALS FROM THE WASTES. AN ASTM WATER LEACH WAS PERFORMED TO EXTRACT CYANIDE FROM EACH WASTE, FOLLOWED BY CYANIDE ANALYSIS OF THE LEACHATE TO EVALUATE THE POTENTIAL OF EACH WASTE TO RELEASE SOLUBLE CYANIDE. THIS ANALYTICAL DATA IS SUMMARIZED IN TABLE 4.

ASTM WATER LEACHING PROCEDURE

BOTH SAMPLES W07 AND W08 WERE SUBJECTED TO THE ASTM WATER LEACHING PROCEDURE TO EVALUATE THE LIKELIHOOD OF CYANIDE LEACHING FROM THE WASTE OR SOIL MATRIX. THE RESULTING DATA FROM THESE TESTS SUGGESTS THAT THE CYANIDE DOES NOT LEACH UNDER THESE TEST CONDITIONS TO ANY APPRECIABLE EXTENT FROM EITHER THE SLUDGE OR SOIL.

HEXAVALENT CHROMIUM ANALYSIS

SAMPLES W07 AND W08 WERE ANALYZED FOR THE PRESENCE OF TOTAL AND HEXAVALENT CHROMIUM AS PART OF THIS ADDITIONAL WASTE CHARACTERIZATION TESTING. ANALYTICAL RESULTS INDICATED THAT TOTAL CHROMIUM WAS PRESENT IN BOTH SAMPLES AT ELEVATED CONCENTRATIONS, HOWEVER HEXAVALENT CHROMIUM WAS NOT DETECTED IN EITHER SAMPLE ABOVE THE METHOD DETECTION LIMIT

(0.5 MG/KG). THIS WOULD INDICATE THAT THE CHROMIUM PRESENT AT THE SITE IS ALL IN THE TRIVALENT, OR LESS TOXIC, FORM.

HOWEVER, THE ANALYTICAL METHODOLOGY UTILIZED TO DETERMINE THE PRESENCE

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OF HEXAVALENT CHROMIUM IN SITE SOILS AND SLUDGES WAS REVIEWED BY EPA REGION IV ANALYTICAL EXPERTS. THESE EXPERTS MAINTAIN THAT THE ANALYSIS TO QUANTIFY THE HEXAVALENT, OR MORE TOXIC FORM, OF CHROMIUM IN A SOIL MATRIX IS UNCERTAIN. THE HEALTH ASSESSMENT STAFF OF EPA REGION IV BELIEVES IT IS PRUDENT, THEREFORE TO ASSUME SOME PORTION OF THE SOIL CHROMIUM TO BE HEXAVALENT UNTIL A METHOD IS VERIFIED TO CONFIRM/NEGATE THE PRESENCE OF HEXAVALENT CHROMIUM IN A SOIL MATRIX.

FOR PURPOSES OF THE RISK ASSESSMENT AT THE SITE, EPA REGION IV BELIEVES BASED ON CONSIDERATION OF AVAILABLE INFORMATION, THAT IT IS CONSERVATIVE, YET REASONABLE TO ASSUME FOR THE GOLDEN STRIP SEPTIC TANK SITE THAT SOME OF THE TOTAL CHROMIUM IN THE SOIL IS HEXAVALENT. EPA REGION IV BELIEVES AN ASSUMPTION OF 10 PERCENT OF THE TOTAL SOIL CHROMIUM BEING HEXAVALENT MAY BE CONSIDERED REASONABLY CONSERVATIVE.

TOXICITY CHARACTERISTIC LEACHING PROCEDURE - ZERO HEADSPACE EXTRACTION

THE ANALYTICAL RESULTS FROM THE ZERO HEADSPACE EXTRACTION (ZHE) INDICATE THAT NONE OF THE TCLP ZHE CONSTITUENTS WERE PRESENT ABOVE METHOD DETECTION LIMITS. ACETONE WAS DETECTED ABOVE THE DETECTION LIMIT IN W08, HOWEVER, ACETONE IS A COMMON LABORATORY ARTIFACT AND IS NOT A ZHE CONSTITUENT.

TOXICITY CHARACTERISTIC LEACHING PROCEDURE - HEAVY METALS

THE TCLP ANALYTICAL RESULTS FROM SAMPLES W07 AND W08 INDICATE THAT CADMIUM WAS PRESENT IN THE EXTRACT AT LEVELS ABOVE THE REGULATORY THRESHOLD. FROM THIS DATA, IT WAS CONCLUDED THAT WASTE PRESENT AT THE SITE WILL EXHIBIT HAZARDOUS CHARACTERISTICS FOR CADMIUM AND A MORE THOROUGH EVALUATION OF THE LEACHING POTENTIAL OF THE COC METALS MAY BE NEEDED.

POTENTIAL LAND FARMING AREAS

THREE AREAS WERE IDENTIFIED AS POTENTIAL LOCATIONS OF FORMER LAND FARMING ACTIVITIES. LAND FARMING MAY HAVE BEEN USED AS A METHOD OF TREATING SEPTIC WASTES. THE THREE AREAS INVESTIGATED DURING THIS STUDY ARE THE AREA SOUTH OF THE LAGOONS, THE AREA EAST OF THE LAGOONS, AND THE NORTHEASTERN CORNER OF THE SITE. THESE AREAS ARE DELINEATED ON FIGURE 2.

A TOTAL OF THIRTEEN SURFACE SOIL SAMPLES WERE TAKEN AT THE THREE SUSPECTED AREAS OF LAND FARMING. SOME TRACE LEVELS OF ORGANIC AND INORGANIC CONSTITUENTS WERE DETECTED, HOWEVER, THE LEVELS OF COCS IN THESE AREAS ARE INSUFFICIENT TO SUGGEST THAT LAND FARMING WAS USED AS A METHOD OF WASTE DISPOSAL AT THE SITE.

AFFECTED SURFACE SOILS

DURING THE SURFACE SOIL INVESTIGATION, WHICH INCLUDED COLLECTION OF

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SAMPLES AT THIRTY-FOUR LOCATIONS WITHIN THE FIRST FOOT BELOW LAND SURFACE, THERE WERE TWO AREAS IDENTIFIED THAT MAY SERVE AS SECONDARY SOURCES DUE TO LAGOON OPERATIONS AND DRAINAGE PATTERNS. THESE AREAS ARE REFERRED TO AS THE "TRUCK TURNAROUND AREA" AND "DRAINAGE SWALE AREA". THE LOCATIONS OF THESE AREAS ARE SHOWN ON FIGURE 3.

TRUCK TURNAROUND AREA

THREE SURFACE SOIL SAMPLES, S15 THROUGH S17 (FIGURE 3), WERE COLLECTED TO INVESTIGATE THIS AREA. THE FOLLOWING ORGANIC COMPOUNDS WERE DETECTED AT LEVELS OF LESS THAN 1 PPM: ETHYLBENZENE, TETRACHLOROETHENE, TOLUENE, XYLENES, AND DIELDRIN. BIS(2-ETHYLHEXYL)PHTHALATE WAS FOUND AT CONCENTRATIONS OF 1.1 AND 130 PPM IN S16 AND S17, RESPECTIVELY. THE HIGHEST CONCENTRATIONS OF INORGANICS FROM ON-SITE SURFACE SOIL SAMPLES WERE FOUND IN S17, INCLUDING 798 PPM OF CADMIUM, 7530 PPM CHROMIUM, 5290 PPM LEAD, 9550 PPM ZINC, AND 186 PPM CYANIDE (TOTAL). ARSENIC WAS DETECTED AT 53.4 PPM IN S17, BUT WAS NOT DETECTED IN THE DUPLICATE SAMPLE OF S17. THESE LEVELS OF INORGANICS ARE HIGHLY ELEVATED OVER BACKGROUND CONCENTRATIONS SHOWN IN TABLE 3 FOR ON-SITE SOILS/SEDIMENTS.

DRAINAGE SWALE

TWO SURFACE SOIL SAMPLES (S25 & S27) AND ONE STREAM SEDIMENT SAMPLE (SS-06) WERE COLLECTED TO INVESTIGATE THIS AREA. LOCATIONS OF THESE SAMPLES ARE SHOWN ON FIGURE 3. SAMPLES S25 AND SS-06 INDICATED THE PRESENCE OF TRACE LEVELS OF ORGANIC COMPOUNDS. ADDITIONALLY, S25 AND SS-06 CONTAINED CONCENTRATIONS OF CADMIUM, CHROMIUM, COPPER, LEAD AND ZINC WELL ABOVE BACKGROUND LEVELS. THIS ANALYTICAL DATA SUPPORTS THE SUSPICION THAT THE SURFACE SOILS LOCATED NEAR THE DRAINAGE SWALE HAVE BEEN AFFECTED BY PAST WASTE DISPOSAL ACTIVITIES AND MAY BE RECEIVING AN APPRECIABLE AMOUNT OF OVERLAND RUN-OFF FROM THE LAGOON AREA.

ABANDONED DRUM AREA

DURING THE RI, TWENTY-SEVEN ABANDONED DRUMS WERE DISCOVERED IN AN AREA ALONG THE EASTERN SIDE OF THE SITE (FIGURE 3). IN FEBRUARY 1990, SIX OF THESE DRUMS HAVING LEGIBLE MARKINGS WERE REMOVED FROM THE AREA, PLACED IN OVERPACK DRUMS, AND STORED IN THE TEMPORARY DRUM STORAGE AREA. AN INVESTIGATION OF THE AREA INCLUDED THE COLLECTION OF SAMPLES FROM THE SURFACE SOIL, HARDENED RESIDUE NOTED NEAR THE DRUMS, AND A COMPOSITE SAMPLE OF THE LIQUID THAT HAD ACCUMULATED IN FOUR OF THE DRUMS.

TWO COMPOSITE SURFACE SAMPLES WERE COLLECTED AT LOCATIONS DOWNSLOPE OF THE DRUM SITE. SAMPLE S35 WAS COLLECTED FROM SURFACE SOILS WITHIN A TEN-FOOT RADIUS OF THE APPROXIMATE CENTER OF THE ABANDONED DRUM AREA. SAMPLE S36 WAS COLLECTED FROM SURFACE SOIL WITHIN A FIFTY-FOOT RADIUS OF

THE APPROXIMATE CENTER OF THE DRUM AREA. ANALYSIS OF THESE SAMPLES INDICATE THE ONLY ORGANIC COMPOUND DETECTED IN S35 AND S36 WAS TOLUENE. CADMIUM, CHROMIUM, COPPER, AND CYANIDE WERE DETECTED IN S35 AT LEVELS GREATER THAN SITE BACKGROUND VALUES. SAMPLE S36 ALSO CONTAINED CADMIUM

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AT A CONCENTRATION GREATER THAN BACKGROUND.

THE RESULTS FROM THE HARDENED RESIDUE INDICATE THE PRESENCE OF LOW LEVELS OF VOCS. THE CONCENTRATIONS OF VOCS OBSERVED IN THE SAMPLES ARE NOT FELT TO BE SUFFICIENTLY HIGH TO CAUSE CONCERN FROM THE STANDPOINT OF TCLP LEACHABILITY. ASSUMING 100 PERCENT LEACHING OF THE VOCS, THE LEVELS OF VOCS PRESENT WOULD STILL CHARACTERIZE THE MATERIAL AS A NON-HAZARDOUS WASTE. OF THE METALS WHICH WERE DETECTED IN THE RESIDUE SAMPLE, CHROMIUM WAS OBSERVED AT A CONCENTRATION THAT MIGHT CAUSE CONCERN FROM A TCLP STANDPOINT. THE HARDENED RESIDUE HAS BEEN CONTAINED IN DRUMS, AWAITING FINAL DISPOSITION.

THE ANALYSES OF THE LIQUID FOUND IN THE ABANDONED DRUMS INDICATE THE PRESENCE OF CADMIUM AT A CONCENTRATION OF 0.0074 PPM WHICH EXCEEDS THE DRINKING WATER MCL FOR CADMIUM OF 0.005 PPM. NO OTHER MCL EXCEEDANCES WERE OBSERVED. THIS DATA INDICATES THAT THE LIQUID IN THE DRUMS HAS LOW LEVELS OF COCS, AND DISPOSITION OF THIS LIQUID SHOULD BE ADDRESSED IN A MANNER SIMILAR TO OTHER LIQUIDS OBSERVED AT THE SITE. THESE LIQUIDS HAVE BEEN PLACED IN CONTAINERS, AWAITING FINAL DISPOSITION.

THE EMPTY DRUMS REMAINING AT THE SITE WERE PLACED IN OVERPACK DRUMS AND TRANSPORTED TO THE DRUM STORAGE AREA MAINTAINED IN THE EXCLUSION ZONE FENCING OF THE SITE. OVERPACK DRUMS WERE LABELED, INCLUDED ON THE EXISTING INVENTORY, AND COVERED UNTIL THEIR DISPOSITION CAN BE DETERMINED.

SURFACE WATER AND STREAM SEDIMENTS

SURFACE WATER SAMPLES WERE COLLECTED FROM THE UNNAMED STREAM AT FIVE LOCATIONS, LABELED SW-1 THROUGH SW-5 ON FIGURE 2. SAMPLE SW-1 WAS COLLECTED TO SERVE AS AN UPGRADIENT SURFACE WATER SAMPLE FOR THE SITE. THIS SAMPLE WAS COLLECTED NEAR THE SPRING HOUSE THAT MRS. RICE USES FOR PERSONAL CONSUMPTION. THE ONLY COMPOUND FOUND ABOVE THE DETECTION LIMIT IN SW-1 WAS COPPER AT 0.026 PPM. IN GENERAL, ONLY THE LAGOON WATER AND THE DRAINAGE SWALE SEDIMENT SAMPLES INDICATED ANY EFFECTS FROM PAST WASTE DISPOSAL ACTIVITIES. STREAM SURFACE WATER AND SEDIMENTS DO NOT APPEAR TO HAVE BEEN AFFECTED BY DISPOSAL OPERATIONS.

NO ORGANIC COMPOUNDS WERE DETECTED FROM SURFACE WATER SAMPLES COLLECTED AT POINTS DOWNSTREAM FROM THE SPRING AREA. IRON AND MANGANESE WERE DETECTED IN THESE SAMPLES AT CONCENTRATIONS OF LESS THAN 1 PPM. ALUMINUM AND ZINC APPEARED IN ONE SAMPLE, HOWEVER, NONE OF THE DETECTED COMPOUNDS ARE INCLUDED IN THE NATIONAL PRIMARY DRINKING WATER STANDARDS. CONCENTRATIONS OF ALUMINUM AND IRON ARE, IN PLACES, SLIGHTLY GREATER THAN THE CONCENTRATIONS IN THE SECONDARY DRINKING WATER REGULATIONS; HOWEVER, THEY ARE BELIEVED TO BE NATURALLY OCCURRING.

SURFACE WATER SAMPLES SW06 AND SW07 WERE COLLECTED FROM OPEN LAGOONS 1 AND 4, RESPECTIVELY. THE ONLY ORGANIC COMPOUND DETECTED IN THE ANALYSES WAS ACETONE AT 0.011 PPM IN SW06. CONCENTRATIONS OF CADMIUM AND

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CHROMIUM WERE DETECTED AT LEVELS EXCEEDING MCLS. CADMIUM (MCL=0.005 PPM) WAS DETECTED AT A LEVEL OF 0.078 PPM IN SW06 AND CHROMIUM (MCL=0.100 PPM) WAS FOUND AT LEVELS OF 0.184 PPM IN SW06 AND 0.498 PPM IN SW07.

FIVE STREAM SEDIMENT SAMPLES WERE COLLECTED FROM THE UNNAMED STREAM AT LOCATIONS ADJACENT TO THE SURFACE WATER SAMPLING LOCATIONS. RESULTS FROM THE ANALYSIS OF THESE SAMPLES FURTHER INDICATE THAT THE STREAM HAS NOT BEEN AFFECTED BY PAST WASTE DISPOSAL ACTIVITIES AT THE SITE.

STREAM SEDIMENT SAMPLES WERE ALSO COLLECTED FROM THE BOTTOM OF THE GULLIES THAT LEAD TOWARD THE UNNAMED STREAM AT SEVERAL LOCATIONS ON-SITE. OF THESE SIX SAMPLES COLLECTED AND ANALYZED, SAMPLE SS-06 HAD THE HIGHEST LEVELS OF COCS AND CONTAINED LEVELS OF CADMIUM, CHROMIUM, LEAD, MERCURY AND ZINC THAT WERE GREATER THAN SITE BACKGROUND CONCENTRATIONS. THIS SAMPLE IS LOCATED IN THE "DRAINAGE SWALE AREA" LOCATED WEST OF LAGOON NOS. 3 AND 4 AND IS SHOWN ON FIGURE 3.

GROUND WATER

SEVENTEEN GROUND WATER MONITORING WELLS WERE INITIALLY INSTALLED AS PART OF THE RI. WELLS WERE INSTALLED TO INVESTIGATE THE HORIZONTAL GROUND WATER FLOW RATES AND DIRECTIONS, VERTICAL GROUND WATER FLOW COMPONENTS, AND WATER QUALITY CONDITIONS. MONITORING WELL LOCATIONS ARE ILLUSTRATED ON FIGURES 2 AND 3.

THIRTEEN MONITORING WELLS (MW-1 THROUGH MW-13) WERE INSTALLED AS SHALLOW WELLS WITH THE WELL SCREEN INTERSECTING THE WATER TABLE. WELLS MW-1, MW-2 AND MW-2A WERE INSTALLED AT APPARENT UPGRADIENT WELL LOCATIONS TO OBTAIN BACKGROUND WATER QUALITY DATA. FOUR WELLS (MW-2A, MW-4A, MW-6A, AND MW-9A) WERE INSTALLED AS DEEP SAPROLITE WELLS.

GROUND WATER FLOW

WATER LEVELS WERE MEASURED FOR SEVEN CONSECUTIVE MONTHS FROM APRIL 1990 THROUGH OCTOBER 1990. THIS WATER LEVEL DATA WAS USED TO DETERMINE THE WATER TABLE CONFIGURATION AT THE SITE. GROUND WATER IN THE VICINITY OF THE SITE OCCURS UNDER UNCONFINED CONDITIONS AND THE WATER TABLE TENDS TO MIMIC THE GENERAL CONTOUR OF THE GROUND SURFACE. GROUND WATER FLOW IS TO THE NORTHWEST OVER MOST OF THE SITE, TOWARD THE UNNAMED STREAM. WEST OF THE STREAM, GROUND WATER FLOWS TO THE NORTHEAST TOWARD THE STREAM.

HYDRAULIC CONDUCTIVITY TESTS WERE PERFORMED ON ALL MONITORING WELLS AND USED TO ESTIMATE GROUND WATER VELOCITY AT THE SITE. HYDRAULIC CONDUCTIVITY VALUES RANGED FROM $5 \times (10^{-5})$ TO $4 \times (10^{-3})$ CM/SEC ACROSS THE SITE. THE AVERAGE FOR WELLS SCREENED WITHIN THE SAPROLITE WAS

4 X (10-4) CM/SEC.

THE AVERAGE HYDRAULIC GRADIENT FOR THE SITE IS 0.03 FEET PER FOOT. THE GRADIENT IS GENERALLY SLIGHTLY LOWER NEAR THE SOUTHERN PORTION OF THE

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SITE (0.025 FEET PER FOOT) AND INCREASES WITH PROXIMITY TO THE UNNAMED STREAM, WHERE A MAXIMUM OF 0.04 FEET PER FOOT WAS CALCULATED.

GROUND WATER VELOCITIES WERE CALCULATED USING THE FORMULA PUBLISHED BY FREEZE AND CHERRY (1979).

$$VS = KI/N$$

WHERE VS = GROUND WATER VELOCITY
K = HYDRAULIC CONDUCTIVITY
I = HYDRAULIC GRADIENT
N = EFFECTIVE POROSITY

AN AVERAGE GRADIENT OF 0.03 FEET/FOOT AND AN AVERAGE HYDRAULIC CONDUCTIVITY OF 4 X (10-4) CM/SEC WERE USED TO CALCULATE GROUND WATER VELOCITY. A RANGE OF EFFECTIVE POROSITY VALUES OF 10 TO 30 PERCENT WAS CHOSEN TO REPRESENT THE VARIABLE SUBSURFACE CONDITIONS. THE CALCULATED VALUES OF GROUND WATER VELOCITY FOR THE SITE RANGE FROM 40 TO 120 FEET PER YEAR.

GROUND WATER QUALITY

TWO COMPLETE GROUND WATER SAMPLING AND ANALYSIS ROUNDS WERE PERFORMED AS PART OF THE INITIAL RI. THE FIRST ROUND OF SAMPLES WAS DIVIDED INTO TWO PHASES. INITIAL GROUND WATER SAMPLES WERE COLLECTED FROM ALL ZONE 1 WELLS AND BACKGROUND WELLS MW-1, MW-2 AND MW-2A IN FEBRUARY 1990. THE INITIAL ROUND OF GROUND WATER SAMPLING AT ZONE 2 WELLS TOOK PLACE IN MAY 1990 AFTER THE LIST OF ANALYTES WAS REVISED. A SECOND ROUND OF SAMPLES WAS COLLECTED ON JULY 1990. BOTH FILTERED AND NON-FILTERED SAMPLES WERE COLLECTED FOR INORGANIC ANALYSES, HOWEVER, EPA REGION IV ONLY RECOGNIZES NON-FILTERED SAMPLES FOR THE PURPOSES OF EVALUATING GROUND WATER QUALITY AT A SITE.

CONCENTRATIONS OF LEAD, CHROMIUM, 1,2-DICHLOROPROPANE, AND 1,2-DICHLOROETHANE WERE DETECTED ABOVE MCLS OR EPA CLEAN-UP LEVELS IN ROUNDS 1 AND 2 OF THE GROUND WATER SAMPLING EVENTS. IT SHOULD BE NOTED THAT THE PROPOSED MCL FOR LEAD IS 0.005 PPM. HOWEVER, A JUNE 21, 1990 MEMORANDUM TO EPA REGION IV TITLED "CLEANUP LEVEL FOR LEAD IN GROUND WATER" FROM HENRY L. LONGEST, DIRECTOR OF THE OFFICE OF EMERGENCY AND REMEDIAL RESPONSE, ESTABLISHED THE CLEANUP LEVEL FOR LEAD IN GROUND WATER AT 0.015 PPM. THE MCL OR CLEAN-UP LEVEL FOR THESE FOUR CONSTITUENTS ARE AS FOLLOWS:

CONSTITUENT	MCL/CLEAN-UP LEVEL (PPM)
LEAD	0.015

CHROMIUM	0.100
1,2-DICHLOROPROPANE	0.005
1,2-DICHLOROETHANE	0.005

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THE FOLLOWING IS A SUMMARY OF THE MCL EXCEEDANCES IN GROUND WATER AT THE SITE FOR SAMPLING EVENTS 1 AND 2:

WELL LOCATION	ROUND	CONSTITUENT	LEVEL (PPM)
MW-03	1	LEAD	0.021
MW-04	1	LEAD	0.027
	1	1,2-DICHLOROPROPANE	0.013
	2	LEAD	0.017
	2	1,2-DICHLOROPROPANE	0.014
MW-05	1	LEAD	0.020
MW-06	2	1,2-DICHLOROETHANE	0.006
MW-09	1	LEAD	0.016
MW-12	1	LEAD	0.050
	1	CHROMIUM	0.279
	2	LEAD	0.032
	2	CHROMIUM	0.164

TEMPORAL VARIATIONS IN THE CONCENTRATIONS OF ORGANIC CONSTITUENTS IN GROUND WATER IS A COMMON PHENOMENON. THE OBSERVED EXCEEDANCE OF THE MCL FOR 1,2-DICHLOROPROPANE AT MW-04 WAS CONFIRMED WHEN THIS COMPOUND WAS DETECTED AT 0.014 PPM IN THE SECOND SAMPLING ROUND. HOWEVER, 1,2-DICHLOROPROPANE WAS NOT DETECTED IN SAMPLES OF THE WASTE OR SOIL. THE VOLATILE ORGANIC COMPOUND 1,2-DICHLOROETHANE WAS DETECTED DURING THE SECOND ROUND ABOVE THE MCL IN THE SAMPLE COLLECTED FROM MW-06. THE PRESENCE OF 1,2-DICHLOROETHANE WAS NOT CONFIRMED IN THE FIRST ROUND. THIS COMPOUND WAS ALSO NOT DETECTED IN SAMPLES OF THE WASTE OR SOIL.

ANALYTICAL RESULTS FROM THESE TWO SAMPLING EVENTS INDICATE LIMITED MIGRATION OF CONTAMINANTS HAS OCCURRED AT THE SITE. BASED UPON RESULTS OF THESE TWO SAMPLING EVENTS, THERE IS NO APPARENT PATTERN OR DISCERNIBLE PLUME OF CONTAMINANTS AT THE SITE. HOWEVER, GIVEN THE CALCULATED GROUND WATER VELOCITIES AND THE 15 TO 30 YEARS THE CONTAMINANTS IDENTIFIED IN THE LAGOON AREA HAD TO MIGRATE, IT WAS SUGGESTED THAT THE MONITORING WELL NETWORK INSTALLED AS PART OF THE RI MIGHT HAVE MISSED DETECTING A PLUME THAT HAD MOVED DOWNGRADIENT.

THE GROUND WATER ANALYTICAL RESULTS FROM MW-12 WERE OF PARTICULAR INTEREST. MW-12 IS LOCATED ON THE WEST SIDE OF THE UNNAMED STREAM AND WAS NOT SUSPECTED TO BE INFLUENCED BY THE SOURCE AREAS (LAGOONS) LOCATED ON THE EAST SIDE OF THE STREAM. REVIEW OF THE HYDROGEOLOGIC

CROSS-SECTIONS FOR THIS AREA INDICATE THAT CROSS CONTAMINATION FROM THE LAGOONS TO MW-12 IS HIGHLY UNLIKELY. TOTAL SUSPENDED SOLIDS (TSS) IN GROUND WATER CAN ELEVATE CONCENTRATIONS OF INORGANIC CONSTITUENTS OVER THE TRUE CONCENTRATIONS OF INORGANICS THAT ARE TRANSPORTED IN THE GROUND

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WATER. BASED UPON THE FILTERED GROUND WATER RESULTS, IT WAS SUGGESTED THAT THE HIGH LEVELS OF LEAD AND CHROMIUM DETECTED IN MW-12 AND THE ELEVATED LEVELS OF LEAD IN MW-03, MW-04, MW-05, MW-09 WERE DUE TO THE PRESENCE OF SUSPENDED SOLIDS IN THE GROUND WATER SAMPLES.

IT WAS MUTUALLY AGREED IN JANUARY 1991 BY EPA, SCDHEC AND THE GOLDEN STRIP TASK GROUP THAT ADDITIONAL STUDIES WERE REQUIRED TO CONFIRM THE LEVEL AND EXTENT OF GROUND WATER CONTAMINATION RESULTING FROM PAST WASTE DISPOSAL PRACTICES. THIS INFORMATION WOULD BE INCLUDED IN A SUPPLEMENTAL GROUND WATER RI REPORT AND UTILIZED TO DETERMINE THE NEED FOR THE EVALUATION OF A GROUND WATER RESPONSE ACTION IN THE FEASIBILITY STUDY FOR THE SITE.

SUPPLEMENTAL REMEDIAL INVESTIGATION (SRI)

IN AN EFFORT TO FURTHER DEFINE THE NATURE AND EXTENT OF GROUND WATER CONTAMINATION PRESENT AT THE SITE, RMT, INC. CONDUCTED THE SRI UNDER THE DIRECTION OF THE EPA. THE OBJECTIVES OF THE SRI WERE TO CONFIRM THE FINDINGS PRESENTED IN THE RI, DETERMINE IF CONCENTRATIONS OF INORGANIC CONSTITUENTS IN THE WELLS WERE DUE TO ELEVATED LEVELS OF SUSPENDED SOLIDS, AND TO DETERMINE IF A GROUND WATER PLUME HAD ESCAPED DETECTION BY THE MONITORING WELL NETWORK INSTALLED DURING THE INITIAL RI. SRI FIELD ACTIVITIES BEGAN IN FEBRUARY 1991 AND CONCLUDED IN MID-MARCH 1991.

THE FOLLOWING ACTIVITIES WERE CONDUCTED AS PART OF THE SRI:

- 1) DRILLING AND INSTALLING FIVE ADDITIONAL GROUND WATER MONITORING WELLS (MW-09B, MW-14, MW-14A, MW-15 AND MW-15A) DOWNGRADIENT FROM THE EXISTING MONITORING WELLS (FIGURE 2);
- 2) REDEVELOPING EXISTING WELLS MW-09 AND MW-12, IN AN EFFORT TO REDUCE THE SUSPENDED SOLIDS IN THE WELL; AND
- 3) COLLECTING AND ANALYZING GROUND WATER SAMPLES FROM THE FIVE NEW WELLS AND THE EXISTING NETWORK OF WELLS IN THE VICINITY OF THE LAGOONS TO CONFIRM PREVIOUS SAMPLE RESULTS.

DURING THE SRI, MODIFICATIONS TO THE SAMPLING PLAN FOR METALS WERE MADE. THE MODIFICATIONS INCLUDED THE IMPLEMENTATION OF A LESS VIOLENT SAMPLING PROCEDURE. MONITORING WELLS WERE PURGED AND SAMPLED USING A PERISTALTIC PUMP INSTEAD OF THE BAILER METHOD THAT WAS UTILIZED DURING THE INITIAL RI. THE INTENT OF THE SAMPLING MODIFICATIONS WAS TO REDUCE THE CONCENTRATION OF SUSPENDED SOLIDS PREVIOUSLY OBSERVED IN SITE MONITORING WELLS DURING ROUNDS 1 AND 2. IN THIS MANNER, IT WAS POSSIBLE TO MORE THOROUGHLY EVALUATE THE TRUE CONDITION OF THE GSST SITE GROUND WATER.

VISUAL INSPECTION OF THE SAMPLES COLLECTED DURING THE SRI INDICATED THAT THE PERISTALTIC PUMP METHOD DOES YIELD A SAMPLE WITH MUCH-REDUCED LEVELS OF SUSPENDED SOLIDS. THE ANALYTICAL RESULTS OBTAINED FROM THIS THIRD ROUND OF GROUND WATER SAMPLING ARE, THEREFORE, CONSIDERED MORE

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INDICATIVE OF ACTUAL GROUND WATER QUALITY. THE PUMP SAMPLING TECHNIQUE IS THE PREFERRED METHOD FOR ACQUIRING SAMPLES WHICH ARE REPRESENTATIVE OF THE GROUND WATER AS IT EXISTS WITHIN THE AQUIFER.

ANALYSES OF GROUND WATER SAMPLES COLLECTED DURING THE SRI SUPPORT THE CONCLUSION THAT PAST WASTE DISPOSAL ACTIVITY CONDUCTED AT GSST HAS HAD ONLY A LIMITED EFFECT ON THE SITE GROUND WATER RESOURCES. THERE WERE NO CONSTITUENTS DETECTED DURING THE THIRD SAMPLING EVENT WHICH HAD NOT BEEN PREVIOUSLY IDENTIFIED DURING ROUNDS 1 AND 2.

THERE WERE TWO MCL EXCEEDANCES DETECTED DURING THE THIRD SAMPLING EVENT. THE ORGANIC COMPOUND 1,2-DICHLOROPROPANE WAS AGAIN DETECTED AT 0.011 PPM IN THE SAMPLE COLLECTED FROM MW-04 AT A CONCENTRATION IN EXCESS OF THE MCL. THE MCL FOR 1,2-DICHLOROPROPANE (0.005 PPM) WAS EXCEEDED IN GROUND WATER SAMPLES COLLECTED FROM MW-04 DURING ROUNDS 1 AND 2. ONLY 1,2-DICHLOROPROPANE HAS BEEN IDENTIFIED AT LEVELS IN EXCESS OF THE MCL IN ALL THREE SAMPLING EVENTS. ANALYSIS OF THE THIRD SAMPLE COLLECTED FROM MW-06 NO LONGER INDICATED THE PRESENCE OF 1,2-DICHLOROETHANE. THE EXCEEDANCE OF THE MCL FOR 1,2-DICHLOROETHANE IN THE SECOND ROUND APPEARS TO BE ANOMALOUS. CHROMIUM WAS THE ONLY INORGANIC CONSTITUENT FOUND AT A CONCENTRATION IN EXCESS OF ITS MCL (0.100 PPM). CHROMIUM WAS DETECTED IN THE SAMPLE COLLECTED FROM MW-06 AT A CONCENTRATION OF 0.118 PPM. ANALYTICAL RESULTS FROM SAMPLES COLLECTED FROM MW-06 INDICATE CHROMIUM WAS NOT DETECTED ABOVE METHOD DETECTION LIMITS IN ROUND 2 AND SLIGHTLY BELOW THE MCL DURING ROUND 1.

DURING THE SRI, MW-09 AND MW-12 WERE REDEVELOPED AND SUBSEQUENTLY RESAMPLED USING THE PERISTALTIC PUMP METHOD. SAMPLES COLLECTED FROM MW-09 AND MW-12 DID NOT CONTAIN EITHER CHROMIUM OR LEAD AT CONCENTRATIONS ABOVE DETECTION LIMITS. SAMPLING WITH THE PERISTALTIC PUMP WAS APPARENTLY SUCCESSFUL IN MINIMIZING THE EFFECT OF SUSPENDED SOLIDS PRESENT IN THE WATER COLUMN ON METALS ANALYSES. THE ABSENCE OF LEAD IN THE GROUND WATER AT MW-09 AND MW-12, AND THE ABSENCE OF CHROMIUM AT MW-12 IS CONSIDERED TO BE MORE REPRESENTATIVE OF TRUE GROUND WATER QUALITY CONDITIONS AT THE SITE THAN THE DATA OBTAINED DURING THE RI IN WHICH ELEVATED LEVELS OF SUSPENDED SOLIDS WERE NOTED IN THE SAMPLES.

LEAD WAS DETECTED ABOVE THE MCL IN SAMPLES COLLECTED FROM MW-03, MW-04, AND MW-05 IN ROUND 1 OF THE RI. LEAD WAS NOT DETECTED ABOVE THE MCL IN SAMPLES COLLECTED FROM THESE WELLS IN ROUND 3 USING THE PERISTALTIC PUMP TECHNIQUE. THESE LEVELS ABOVE THE MCL IN ROUND 1 ARE ATTRIBUTED TO HIGH LEVELS OF SUSPENDED SOLIDS IN THE GROUND WATER SAMPLES.

GROUND WATER SAMPLES COLLECTED FROM THE FIVE NEW WELLS INSTALLED DURING THE SRI SHOWED NO INDICATIONS OF HAVING BEEN AFFECTED BY GSST PAST WASTE DISPOSAL ACTIVITY. THE ONLY ORGANIC COMPOUND DETECTED WAS ACETONE AT A

CONCENTRATION OF 0.012 PPM IN THE SAMPLE COLLECTED FROM MW-14A. ACETONE WAS NOT DETECTED IN THE ASSOCIATED ANALYTICAL METHOD BLANK AND IS ATTRIBUTED TO LABORATORY PROCEDURES. THESE RESULTS ARE SIGNIFICANT SINCE THEY DEMONSTRATE THAT A PLUME OF GROUND WATER CONSTITUENTS HAS NOT

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MOVED OFF-SITE FROM THE AREA OF THE LAGOONS AND ONLY LIMITED EFFECTS TO THE GROUND WATER AT GSST HAVE OCCURRED.

THE RESULTS OF THE SRI DEMONSTRATE THAT THERE IS NO DATA TO SUPPORT AN ASSUMPTION THAT A GROUND WATER PLUME EXISTS AND HAS ESCAPED DETECTION BY THE MONITORING WELL NETWORK INSTALLED DURING THE RI. THE RESULTS OF THE SRI FURTHER CONFIRM THE TOTAL ABSENCE OF A DISCERNIBLE PLUME OF WASTE CONSTITUENTS IN THE GROUND WATER. ONLY LIMITED EXCEEDANCES OF GROUND WATER MCLS WITHIN THE IMMEDIATE VICINITY OF THE LAGOON AREA HAS BEEN CONFIRMED DURING THE THREE ROUNDS OF GROUND WATER SAMPLING.

AIR MONITORING

AIR SAMPLES WERE COLLECTED TO INVESTIGATE THE PRESENCE OF AIRBORNE PARTICULATE MATTER, HYDROCARBONS, AND OTHER POTENTIALLY HAZARDOUS COMPOUNDS AT THE SITE. AIR MONITORING CONSISTED OF BOTH BACKGROUND SAMPLING AND ON-SITE MONITORING DURING FIELD ACTIVITIES.

BACKGROUND MONITORING

THE INITIAL BACKGROUND SAMPLES WERE TAKEN TO CHARACTERIZE ROUTINE EXPOSURE AT THE SITE PRIOR TO FIELD ACTIVITIES. REPRESENTATIVE SAMPLE LOCATIONS WERE SELECTED BASED ON THE PREDOMINANT WIND DIRECTION AT THE TIME OF THE FIELD STUDY. A METEOROLOGICAL STATION WAS ESTABLISHED TWO DAYS PRIOR TO THE SAMPLING EVENT. MEASUREMENTS OF WIND SPEED, WIND DIRECTION, AND AMBIENT TEMPERATURE WERE RECORDED THE DAY OF SAMPLING.

SAMPLING FOR AIRBORNE METALS WAS CONDUCTED AT FIVE LOCATIONS ACROSS THE SITE. A SAMPLE WAS COLLECTED AT THE UPWIND, THE DOWNWIND, AND EACH OF THE CROSSWIND LOCATIONS. A FIFTH SAMPLE WAS COLLECTED IN THE LAGOON AREA. SAMPLES WERE ANALYZED FOR TWENTY METALLIC CONSTITUENTS. ALUMINUM WAS DETECTED IN ONE SAMPLE, IRON IN THREE SAMPLES, AND MAGNESIUM IN ONE SAMPLE. THE CONCENTRATIONS ARE AT OR JUST ABOVE THE DETECTION LIMIT OF 0.001 MG/M3 OF AIR.

AIR SAMPLING FOR ORGANIC VAPORS WAS CONDUCTED AT THE UPWIND AND DOWNWIND LOCATIONS, AS WELL AS AT THE LAGOON AREA LOCATION. HALOGENATED HYDROCARBONS WERE DETECTED AT CONCENTRATIONS IN THE PARTS PER TRILLION (PPT) RANGE. CONCENTRATIONS WERE GENERALLY CONSISTENT UPWIND, DOWNWIND, AND ON-SITE. CARBON MONOXIDE RANGED FROM 134 TO 342 PARTS PER BILLION (PPB) WITH THE LOWER CONCENTRATIONS ON-SITE. CARBON DIOXIDE CONCENTRATIONS RANGED FROM 350 TO 1450 PPB WITH THE LOWER CONCENTRATIONS OFF-SITE. METHANE CONCENTRATIONS WERE CONSISTENT FOR ALL SAMPLE LOCATION AT APPROXIMATELY 2 PPM. IN ADDITION, AIR SAMPLES WERE ANALYZED FOR 74 NON-HALOGENATED HYDROCARBONS. SIXTEEN WERE DETECTED UPWIND AND ON-SITE, AND 23 WERE DETECTED DOWNWIND.

ON-SITE AIR MONITORING

ON-SITE AIR MONITORING WAS CONDUCTED ROUTINELY DURING SUBSURFACE

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ACTIVITIES AND OTHER ACTIVITIES THAT WERE JUDGED BY ON-SITE PERSONNEL AS HAVING THE POTENTIAL TO ENCOUNTER SOURCES OF ORGANIC GASES OR VAPORS. THE PERSONAL HYDROGEN CYANIDE MONITORS WERE ALSO WORN BY SITE PERSONNEL DURING SUBSURFACE ACTIVITIES.

DURING MONITORING ACTIVITIES, ORGANIC VAPOR AND HCN CONCENTRATIONS WERE MEASURED AT LESS THAN THE ESTABLISHED ACTION LEVELS FOR THE MAJORITY OF SITE WORK. HOWEVER, DURING DRILLING OF SOIL BORING SB-8A, AN UNIDENTIFIED ODOR WAS DETECTED AT THE DRILLING LOCATION. NONE OF THE MONITORING INSTRUMENTS RESPONDED TO THIS ODOR. BECAUSE OF THE UNKNOWN NATURE OF THE ODOR, WORK WAS STOPPED AND RESTARTED USING LEVEL B PERSONAL PROTECTIVE EQUIPMENT (SELF CONTAINED BREATHING APPARATUS). ADDITIONAL AIR MONITORING WAS CONDUCTED THE FOLLOWING DAY USING A PERSONAL SAMPLING PUMP AND CHARCOAL SAMPLING MEDIA. TOLUENE WAS DETECTED AT LESS THAN 1 PPM ALONG WITH TRACE AMOUNTS OF PETROLEUM DISTILLATE. THE ODOR WAS NOT NOTED ON THE DAY SAMPLING OCCURRED. FOLLOWING RECEIPT OF SAMPLE RESULTS, WORK IN LEVEL B PERSONAL PROTECTIVE EQUIPMENT WAS DISCONTINUED.

NATURE AND EXTENT OF CONTAMINATION

THE FOLLOWING DISCUSSION IS A SUMMARY OF THE NATURE AND EXTENT OF WASTES AND AFFECTED MEDIA AT THE GOLDEN STRIP SEPTIC TANK SITE.

- * A CONSTITUENTS OF CONCERN (COC) LIST FOR THE SITE HAS BEEN DEVELOPED FOR PURPOSES OF THE BASELINE RISK ASSESSMENT DISCUSSED IN SECTION 6.0 - SUMMARY OF SITE RISKS AND ARE TO BE ADDRESSED THROUGH THE SELECTED REMEDY IN THIS ROD. THIS LIST INCLUDES THOSE CONSTITUENTS THAT ARE RELATED TO THE LAGOON OPERATIONS, AS INDICATED BY THE COMPOSITION OF THE WASTE, OR HAVE BEEN DETECTED REPEATEDLY THROUGHOUT THE SITE. THIRTEEN INORGANIC CONSTITUENTS THAT ARE APPARENTLY NOT WASTE-RELATED HAVE BEEN DISCUSSED AT THE BEGINNING OF THIS SECTION AND WERE DELETED FROM THE COC LIST. THE COC LIST IS AS FOLLOWS:

INORGANICS

ANTIMONY
ARSENIC
CADMIUM
CHROMIUM
COPPER
LEAD
MERCURY

ORGANICS

ACETONE
BIS(2-ETHYLHEXYL)PHTHALATE
2-BUTANONE (A.K.A. METHYL
ETHYL KETONE)
CHLOROBENZENE
CHLOROFORM
1,2-DICHLOROETHANE

NICKEL
ZINC
CYANIDE

1,2-DICHLOROETHENE
1,2-DICHLOROPROPANE
ETHYLBENZENE
METHYLENE CHLORIDE

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STYRENE
TETRACHLOROETHENE
TOLUENE
1,1,1-TRICHLOROETHANE
XYLENES

- * LAGOON SLUDGES AND SURFACE SOILS WITHIN THE IMMEDIATE VICINITY OF THE OPEN AND CLOSED LAGOONS HAVE BEEN AFFECTED BY PAST WASTE DISPOSAL ACTIVITIES. SLUDGES AND SEDIMENTS IN THE LAGOONS CONTAIN METAL AND CYANIDE CONCENTRATIONS RANGING FROM BELOW OBSERVED SITE BACKGROUND LEVELS TO SUBSTANTIALLY ABOVE SITE BACKGROUND CONDITIONS. LOW CONCENTRATIONS OF SEVERAL VOLATILE AND SEMI-VOLATILE ORGANIC COMPOUNDS WERE ALSO DETECTED IN THE SLUDGE AND SEDIMENTS.
- * ADDITIONAL ANALYSES OF THE LAGOON WASTE AND AFFECTED SOIL DEMONSTRATED THAT IT EXHIBITS HAZARDOUS CHARACTERISTICS FOR CADMIUM AS DETERMINED BY TCLP ANALYSIS.
- * SURFACE SOILS IN THE SUSPECTED TRUCK TURNAROUND AREA AND NEAR A DRAINAGE SWALE WEST OF LAGOON NOS. 3 AND 4 HAVE BEEN AFFECTED TO A LIMITED DEGREE BY PAST WASTE DISPOSAL PRACTICES.
- * A SMALL AREA ON THE EASTERN SIDE OF THE RICE FARM WAS IDENTIFIED TO CONTAIN 27 ABANDONED DRUMS. INVESTIGATIONS INDICATED THAT THIS AREA HAS BEEN AFFECTED TO A LIMITED DEGREE BY PAST WASTE DISPOSAL ACTIVITIES.
- * SURFACE WATER CONTAINED IN OPEN LAGOON NOS. 1 AND 4 HAS BEEN AFFECTED BY PAST WASTE DISPOSAL ACTIVITIES. THE QUALITY OF THE SURFACE WATER IMPOUNDED IN LAGOONS 1 AND 4 WAS FOUND TO EXCEED THE SAFE DRINKING WATER ACT PRIMARY STANDARDS ESTABLISHED FOR CADMIUM (0.005 PPM) AND CHROMIUM (0.100 PPM). THE HIGHEST OBSERVED LEVELS OF CADMIUM AND CHROMIUM WERE 0.08 PPM AND 0.5 PPM, RESPECTIVELY. SECONDARY DRINKING WATER STANDARDS FOR IRON (0.3 PPM) AND MANGANESE (0.05 PPM) WERE ALSO EXCEEDED AT CONCENTRATIONS OF 11.5 PPM AND 0.44 PPM, RESPECTIVELY.
- * THE UNNAMED STREAM THAT PASSES THROUGH THE SITE HAS NOT BEEN AFFECTED. ANALYSIS OF WATER AND SEDIMENT SAMPLES FROM THE STREAM SHOW NO INDICATIONS OF ELEVATED LEVELS OF COCS IDENTIFIED DURING THE RI.

- * AGRICULTURAL ACTIVITIES WERE CONDUCTED BEYOND THE NORTHERN, EASTERN, AND SOUTHERN BOUNDARIES OF THE ACTIVE WASTE DISPOSAL AREAS. THESE AREAS WERE SAMPLED BECAUSE AERIAL PHOTOGRAPHS TAKEN AT GSST DURING THE TIME OF ACTIVE

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SITE OPERATIONS SHOWED THESE FIELDS TO BE UNDER CULTIVATION, RAISING THE QUESTION OF THE POTENTIAL FOR LAND FARMING WASTES. ANALYTICAL RESULTS FROM SOIL SAMPLES COLLECTED IN PREVIOUSLY CULTIVATED AREAS OF THE GSST SITE SHOWED NO INDICATIONS OF ELEVATED LEVELS OF COCS RELATED TO PAST WASTE DISPOSAL ACTIVITIES TO THE NORTH AND SOUTH OF THE LAGOON AREAS.

- * ANALYTICAL RESULTS FROM THREE ROUNDS OF GROUND WATER SAMPLING INDICATE THAT GROUND WATER HAS BEEN AFFECTED TO A LIMITED EXTENT BY PAST WASTE DISPOSAL PRACTICES. LEAD, CHROMIUM, 1,2-DICHLOROPROPANE, AND 1,2-DICHLOROETHANE EXCEEDED PROMULGATED SAFE DRINKING WATER ACT MCLS. HOWEVER, THERE IS NO APPARENT PATTERN OF CONSTITUENT PRESENCE OR CONCENTRATION IN THE GROUND WATER ANALYSES. BASED UPON THE GROUND WATER STUDIES CONDUCTED TO DATE, ALTERNATE CONCENTRATION LIMITS FOR THE OBSERVED, INTERMITTENT MCL EXCEEDANCES WILL BE ESTABLISHED. IN ADDITION, A LONG-TERM MONITORING PROGRAM WILL BE ESTABLISHED AS PART OF THIS ROD TO MONITOR THE CONCENTRATIONS OF THESE CONSTITUENTS DURING IMPLEMENTATION OF THE SELECTED SOURCE REMEDY CONTAINED IN SECTION 9.0 OF THIS ROD. THIS COMPREHENSIVE ENVIRONMENTAL MONITORING PROGRAM WILL ALSO ENSURE THE SELECTED REMEDY IS EFFECTIVELY IMMOBILIZING THE IDENTIFIED WASTE AND REMAINS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT.
- * BACKGROUND AND ON-SITE AIR SAMPLING INDICATES THAT LOCAL AMBIENT AIR HAS NOT BEEN AFFECTED BY PAST WASTE DISPOSAL ACTIVITIES.

#SSR SUMMARY OF SITE RISKS

A BASELINE RISK ASSESSMENT WAS CONDUCTED AS PART OF THE REMEDIAL INVESTIGATION TO ASSESS THE POTENTIAL EFFECT ON PUBLIC HEALTH AND WELFARE FROM THE GSST WASTE CONSTITUENTS OF CONCERN THAT WERE IDENTIFIED DURING THE INVESTIGATION. THE BASELINE RISK ASSESSMENT CAN BE FOUND IN ITS ENTIRETY IN SECTION 5 OF THE FINAL REMEDIAL INVESTIGATION REPORT. THIS SECTION OF THE RECORD OF DECISION PRESENTS A SUMMARY OF SITE RISKS AND CONSISTS OF THE FOLLOWING SECTIONS: CONTAMINANT IDENTIFICATION, EXPOSURE ASSESSMENT, TOXICITY ASSESSMENT, RISK CHARACTERIZATION, AND ENVIRONMENTAL (ECOLOGICAL) ASSESSMENT. DUE TO THE VOLUME OF TABLES INCLUDED IN THIS SECTION, THE TEXT IS PRESENTED FIRST AND IS THEN FOLLOWED BY THE REFERENCED TABLES IN AN EFFORT TO INCREASE THE

READABILITY OF THIS SECTION.

CONTAMINANT IDENTIFICATION

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AT THE GOLDEN STRIP SEPTIC TANK SITE THE FOLLOWING MEDIA WERE ASSESSED FOR CONTAMINATION: GROUND WATER, SOIL (SURFACE AND SUBSURFACE), SURFACE WATER (IN LAGOON AND IN STREAM), AND LAGOON SLUDGE.

FOR EACH CONTAMINANT OF CONCERN IN A GIVEN MEDIUM, AN EXPOSURE POINT CONCENTRATION WAS DETERMINED BY CALCULATING THE STATISTICAL UPPER CONFIDENCE LIMIT (UCL) OF THE SAMPLE RESULTS. IF TOO FEW DATA WERE AVAILABLE TO CALCULATE A UCL, THE MAXIMUM DETECTED VALUE WAS USED AS THE EXPOSURE POINT CONCENTRATION. EXPOSURE POINT CONCENTRATIONS ARE SHOWN FOR EACH MEDIUM IN TABLE 5.

EXPOSURE ASSESSMENT

CURRENTLY THE SITE IS ENCLOSED BY A SECURED FENCE. INDIVIDUALS, FROM RESIDENTIAL AREAS TO THE NORTH, EAST AND WEST COULD TRESPASS ONTO THE SITE. BECAUSE OF THE LAND USE OF THE SURROUNDING AREA, IT IS FEASIBLE THAT IN THE FUTURE THE SITE COULD BECOME RESIDENTIAL OR RECREATIONAL. TO QUANTIFY POTENTIAL EXPOSURE, THE FOLLOWING CURRENT AND FUTURE LAND USE SCENARIOS WERE DEVELOPED:

CURRENT LAND USE

ASSUMES THAT A 6-12 YEAR OLD CHILD TRESPASSES ONTO THE SITE 180 DAYS PER YEAR FOR 6 YEARS. THE CHILD'S AVERAGE BODY WEIGHT IS 30 KG. EXPOSURE OCCURS VIA DERMAL CONTACT WITH AN INCIDENTAL INGESTION OF THE SURFACE SOIL, DERMAL CONTACT WITH STREAM WATER/SEDIMENTS AND LAGOON WATER/SLUDGES, AND INGESTION OF LAGOON SURFACE WATER.

FUTURE LAND USE

1) ASSUMES THE SITE IS DEVELOPED INTO A PUBLIC PARK. EXPOSURE TO THE SITE OCCURS VIA THE SAME PATHWAYS AS IN THE CURRENT USE SCENARIO TO AN ADULT AND TO A CHILD. THE EXPOSED CHILD WAS ASSUMED TO BE AGED 1-10, WEIGH AN AVERAGE OF 22 KG, AND TO VISIT THE SITE 180 DAYS PER YEAR FOR 9 YEARS. THE ADULT WAS ASSUMED TO WEIGH 70 KG AND VISIT THE SITE 180 DAYS PER YEAR FOR 30 YEARS.

2) ASSUMES RESIDENTIAL DEVELOPMENT ON THE SITE. EXPOSURE IS ASSUMED TO OCCUR TO AN ADULT AND A CHILD VIA ALL THE PATHWAYS LISTED FOR SCENARIO #1, BUT WITH DAILY EXPOSURE. ADDITIONALLY THIS SCENARIO INCLUDED DAILY INGESTION OF ON-SITE GROUND WATER.

TOXICITY ASSESSMENT

UNDER CURRENT EPA GUIDELINES, THE LIKELIHOOD OF ADVERSE EFFECTS TO OCCUR IN HUMANS FROM CARCINOGENS AND NONCARCINOGENS ARE CONSIDERED SEPARATELY.

THESE ARE DISCUSSED BELOW.

CARCINOGENS

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EPA USES A WEIGHT-OF-EVIDENCE SYSTEM TO CLASSIFY A CHEMICAL'S POTENTIAL TO CAUSE CANCER IN HUMANS. ALL EVALUATED CHEMICALS FALL INTO ONE OF THE FOLLOWING CATEGORIES: CLASS A- KNOWN HUMAN CARCINOGEN; CLASS B- PROBABLE HUMAN CARCINOGEN- B1 MEANS THERE IS LIMITED HUMAN EPIDEMIOLOGICAL EVIDENCE, AND B2 MEANS THERE IS SUFFICIENT EVIDENCE IN ANIMALS AND INADEQUATE OR NO EVIDENCE IN HUMANS; CLASS C- POSSIBLE HUMAN CARCINOGEN; CLASS D- NOT CLASSIFIABLE AS TO HUMAN CARCINOGENICITY; AND CLASS E -EVIDENCE OF NONCARCINOGENICITY FOR HUMANS.

CANCER SLOPE FACTORS (SFS), INDICATIVE OF CARCINOGENIC POTENCY, ARE DEVELOPED BY EPA'S CARCINOGENIC ASSESSMENT GROUP TO ESTIMATE EXCESS LIFETIME CANCER RISKS ASSOCIATED WITH EXPOSURE TO POTENTIALLY CARCINOGENIC CHEMICALS. SFS ARE DERIVED FROM THE RESULTS OF HUMAN EPIDEMIOLOGICAL STUDIES OR CHRONIC ANIMAL BIOASSAYS TO WHICH ANIMAL-TO-HUMAN EXTRAPOLATION AND UNCERTAINTY FACTORS HAVE BEEN APPLIED. SFS, WHICH ARE EXPRESSED IN UNITS OF (MG/KG-DAY)⁽⁻¹⁾, ARE MULTIPLIED BY THE ESTIMATED INTAKE OF A POTENTIAL CARCINOGEN TO PROVIDE AN UPPER-BOUND ESTIMATE OF THE EXCESS LIFETIME CANCER RISK ASSOCIATED WITH EXPOSURE AT THAT INTAKE LEVEL. THE TERM "UPPER-BOUND" REFERS TO THE CONSERVATIVE ESTIMATE OF THE RISKS CALCULATED FROM THE SF. THIS APPROACH MAKES UNDERESTIMATION OF THE ACTUAL CANCER RISK HIGHLY UNLIKELY.

TABLE 6 LISTS ALL CARCINOGENIC CONTAMINANTS OF CONCERN ALONG WITH RESPECTIVE CANCER CLASSIFICATIONS AND SLOPE FACTORS.

NONCARCINOGENS

REFERENCE DOSES (RFDS) HAVE BEEN DEVELOPED BY EPA FOR INDICATING THE POTENTIAL FOR ADVERSE HEALTH EFFECTS OTHER THAN CANCER. RFDS, WHICH ARE EXPRESSED IN UNITS OF MG/KD-DAY, ARE ESTIMATES OF CHRONIC DAILY EXPOSURE FOR HUMANS, INCLUDING SENSITIVE INDIVIDUALS, THAT ARE THOUGHT TO BE FREE OF ANY ADVERSE EFFECTS. RFDS ARE DERIVED FROM HUMAN EPIDEMIOLOGICAL DATA OR EXTRAPOLATED FROM ANIMAL STUDIES TO WHICH UNCERTAINTY FACTORS HAVE BEEN APPLIED. THESE UNCERTAINTY FACTORS HELP ENSURE THAT THE RFDS WILL NOT UNDERESTIMATE THE POTENTIAL FOR ADVERSE NONCARCINOGENIC EFFECTS TO OCCUR. ESTIMATED INTAKE OF CHEMICALS FROM ENVIRONMENTAL MEDIA CAN BE COMPARED TO THE RFD FOR EACH OF THE CONTAMINANTS.

TABLE 7 LISTS ALL CONTAMINANTS OF CONCERN WITH THEIR RESPECTIVE RFDS.

RISK CHARACTERIZATION SUMMARY

EXCESS LIFETIME CANCER RISKS ARE DETERMINED BY MULTIPLYING THE CHRONIC DAILY INTAKE (CDI) BY THE SLOPE FACTOR. THESE RISKS ARE PROBABILITIES THAT ARE GENERALLY EXPRESSED IN SCIENTIFIC NOTATION (E.G., $1 \times (10^{-6})$ OR $1E-06$). AN EXCESS LIFETIME CANCER RISK OF $1E-06$ INDICATES THAT, AS AN

UPPERBOUND ESTIMATE, AN INDIVIDUAL HAS A ONE IN ONE MILLION CHANCE OF DEVELOPING CANCER IN HIS/HER LIFETIME AS A RESULT OF EXPOSURE TO A SITE RELATED CARCINOGEN UNDER THE SPECIFIC EXPOSURE CONDITIONS AT A SITE.

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THE POTENTIAL FOR NONCARCINOGENIC EFFECTS FROM A SINGLE CONTAMINANT IN A SINGLE MEDIUM IS EXPRESSED AS A HAZARD QUOTIENT (HQ). THE HQ IS THE RATIO OF THE ESTIMATED HUMAN INTAKE TO THE RFD FOR A PARTICULAR CONTAMINANT. BY ADDING THE HQS FOR ALL CONTAMINANTS WITHIN A MEDIUM AND THEN ACROSS ALL MEDIA TO WHICH A GIVEN POPULATION MAY REASONABLY BE EXPOSED, THE HAZARD INDEX (HI) CAN BE GENERATED. THE HI PROVIDES A USEFUL REFERENCE POINT FOR ASSESSING THE POTENTIAL SIGNIFICANCE OF EXPOSURE TO MULTIPLE CONTAMINANTS ACROSS MULTIPLE MEDIA.

THE RESULTANT RISKS AND HI FOR THE CURRENT LAND USE-TRESPASSER SCENARIO ARE SHOWN, BY PATHWAY AND MEDIUM, IN TABLES 8 AND 9, RESPECTIVELY. THE TOTAL RISK FOR THIS SCENARIO IS $2.3E-05$ (2.3 IN 100,000). THE HI FOR THIS SCENARIO IS 8.2.

THE RISKS AND HI FOR THE FUTURE LAND USE-PARK SCENARIO ARE SHOWN, BY PATHWAY AND MEDIUM, IN TABLES 10 AND 11, RESPECTIVELY. THE TOTAL RISK FOR THIS SCENARIO IS $9.3E-05$ (9.3 IN 100,000) AND THE HI IS 10.0.

THE RISKS AND THE HI FOR THE FUTURE LAND USE-RESIDENTIAL SCENARIO ARE SHOWN, BY PATHWAY AND MEDIUM, IN TABLES 12 AND 13, RESPECTIVELY. THE TOTAL RISK FOR THIS SCENARIO IS $1.8E-04$ (1.8 IN 10,000) AND THE HI IS 20.0.

THE PATHWAY AND TOTAL RISKS AND HIS ARE SHOWN IN TABLE 14 FOR EACH SCENARIO. EPA'S TARGETED RISK RANGE FOR CLEANUP OF SUPERFUND SITES IS $1E-04$ TO $1E-06$. RISKS LESS THAN $1E-06$ ARE DEEMED ACCEPTABLE AND THOSE GREATER THAN $1E-04$ ARE UNACCEPTABLE TO EPA. RISKS THAT FALL BETWEEN $1E-04$ AND $1E-06$ MAY OR MAY NOT WARRANT ACTION, DEPENDING ON SITE-SPECIFIC FACTORS CONSIDERED BY THE RISK MANAGER. NONCARCINOGENIC HI VALUES GREATER THAN 1.0 INDICATE THAT REMEDIAL ACTION SHOULD BE TAKEN.

WHILE THE ESTIMATED RISK FOR THE CURRENT USE SCENARIO IS WITHIN THE TARGET RISK RANGE, THE ESTIMATED RISK FROM THE TWO FUTURE USE SCENARIOS ARE BOTH APPROXIMATELY EQUAL TO THE CUTOFF RISK LEVEL OF $1E-04$ (ONE IN 10,000). DIAL ACTION SHOULD BE CONSIDERED BASED ON POTENTIAL CARCINOGENIC RISKS TO FUTURE POPULATIONS. EXPOSURE TO ARSENIC IN THE SOIL AND IN THE LAGOON SLUDGE CONTRIBUTED SIGNIFICANTLY TO THIS RISK, WITH ORGANIC CONTAMINANTS IN GROUND WATER CONTRIBUTING SOMEWHAT LESS SIGNIFICANTLY.

THE ACCEPTABLE HI VALUE OF 1.0 IS EXCEEDED IN THE CURRENT LAND USE SCENARIO, AND MORE NOTABLY EXCEEDED IN EACH OF THE TWO FUTURE LAND USE SCENARIOS. THEREFORE POTENTIAL NONCARCINOGENIC ADVERSE EFFECTS TO EXPOSED POPULATIONS ARE INDICATED IF NO REMEDIAL ACTION IS TAKEN AT THE GSST SITE. THE LARGEST CONTRIBUTION TO THE HI IS FROM EXPOSURE TO

EXCESSIVE METALS (ESPECIALLY CADMIUM AND ANTIMONY) IN THE LAGOON SLUDGE AND SOIL.

THE RISK ASSESSMENT PROCESS CONTAINS INHERENT UNCERTAINTIES. EXPOSURE

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PARAMETERS SUCH AS FREQUENCY AND DURATION OF EXPOSURE AND INGESTION RATE OF CONTAMINATED MEDIA CAN VARY BETWEEN INDIVIDUALS. THEREFORE, UPPERBOUND VALUES WERE USED TO ESTIMATE EXPOSURE, IN ORDER TO BE MORE PROTECTIVE OF HUMAN HEALTH. SLOPE FACTORS AND REFERENCE DOSES EACH INVOLVE EXTRAPOLATION TO WHICH CONSERVATIVE UNCERTAINTY FACTORS ARE ADDED IN ORDER TO BE PROTECTIVE OF SENSITIVE HUMANS. SOME ADDITIONAL SOURCES OF UNCERTAINTY IN THE GSST RISK ASSESSMENT INCLUDE:

- * LACK OF QUANTIFICATION OF HAZARD/RISK FROM EXPOSURE TO LEAD MAY UNDERESTIMATE THE TRUE RISK; THOUGH NO SF OR RFD IS VERIFIED FOR LEAD, EPA HAS ESTABLISHED CLEANUP GOALS FOR LEAD IN BOTH GROUND WATER (0.015 MG/L) AND SOIL (500 MG/KG) AT SUPERFUND SITES.
- * LEVEL OF EACH VALENCE FORM OF CHROMIUM IN ENVIRONMENTAL MEDIA AT THE GSST SITE. IN ADDITION TO BEING A CLASS A CARCINOGEN BY THE INHALATION ROUTE OF EXPOSURE, HEXAVALENT CHROMIUM (CR(VI)) IS ESTIMATED TO EXHIBIT NONCARCINOGENIC EFFECTS VIA THE ORAL ROUTE AT A 200-FOLD LOWER DOSE THAN THE TRIVALENT FORM. SINCE QUANTIFICATION OF CR(VI) IS DIFFICULT TO VERIFY IN SOIL SAMPLES, A PERCENTAGE OF THE TOTAL CR WAS ASSUMED TO BE CR(VI), IN ORDER TO BE CONSERVATIVE. THIS UNCERTAINTY COULD OVER- OR UNDERESTIMATE THE TRUE RISK AT THE SITE.
- * CONSERVATIVE ASSUMPTIONS WERE USED TO ESTIMATE EXPOSURE TO UNEXPOSED LAGOON WASTES. THIS MAY OVERESTIMATE THE TRUE RISK.

ENVIRONMENTAL (ECOLOGICAL) RISKS

FEATURES AT THE SITE INCLUDING A SMALL STREAM, TWO LAGOONS, WOODED AREAS, AND OPEN FIELDS PROVIDE A VARIETY OF ECOLOGICAL HABITATS. NO UNIQUE OR SENSITIVE HABITATS WERE IDENTIFIED AT THE SITE, AND NO VEGETATIVE STRESS IS EVIDENT.

TO DETERMINE WHETHER THE SITE MAY HAVE ADVERSE EFFECTS ON ENVIRONMENTAL RECEPTORS, THE EXPOSURE VALUES WERE COMPARED TO EXPERIMENTALLY DERIVED NO OBSERVED ADVERSE EFFECT LEVELS (NOAEL) OR LOWEST OBSERVED ADVERSE EFFECT LEVELS (LOAEL) IN EPA'S TOXICITY DATABASE. THIS COMPARISON, SHOWN IN TABLE 15, INDICATED THAT INORGANIC (METAL) CONTAMINANTS IN THE LAGOON WATER AND IN THE SOIL COULD HAVE POTENTIAL ADVERSE IMPACT ON WILDLIFE AT THE SITE.

BASED UPON THE INFORMATION CONTAINED IN THE BASELINE RISK ASSESSMENT AND SUMMARIZED IN THIS SECTION, ACTUAL OR THREATENED RELEASES OF HAZARDOUS

SUBSTANCES FROM THIS SITE, IF NOT ADDRESSED BY IMPLEMENTING THE RESPONSE ACTION SELECTED IN THIS RECORD OF DECISION, MAY PRESENT AN IMMINENT AND SUBSTANTIAL ENDANGERMENT TO PUBLIC HEALTH, WELFARE, OR, THE ENVIRONMENT.

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#DOA
DESCRIPTION OF ALTERNATIVES

A FEASIBILITY STUDY (FS) WAS CONDUCTED TO DEVELOP AND EVALUATE REMEDIAL ALTERNATIVES TO ADDRESS THE SLUDGE MATERIALS CONTAINED WITHIN THE GSST LAGOONS, THE UNDERLYING SOILS AND AFFECTED SURFACE SOILS. THE PRIMARY OBJECTIVE OF THE FS WAS TO DETERMINE AND EVALUATE ALTERNATIVES FOR THE APPROPRIATE EXTENT OF REMEDIAL ACTION TO PREVENT OR MITIGATE THE MIGRATION OR THE RELEASE OR THREATENED RELEASE OF HAZARDOUS SUBSTANCES FROM THE SITE. THE FOLLOWING SECTION OF THIS ROD PROVIDES A SUMMARY OF THE EIGHT ALTERNATIVES THAT WERE DEVELOPED AS PART OF THE FS.

THE FS WAS CONDUCTED IN THREE PHASES. PHASE I CONSISTED OF IDENTIFYING POSSIBLE REMEDIAL ACTION ALTERNATIVES FOR EACH OF THE AFFECTED MEDIA. REMEDIAL ACTION OBJECTIVES WERE SPECIFIED FOR THE SITE CONSTITUENTS USING CRITERIA THAT ARE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT. TO ACHIEVE THE OBJECTIVES, GENERAL RESPONSE ACTIONS WERE IDENTIFIED FOR EACH MEDIUM, INCLUDING SOIL, SLUDGE, AND IMPOUNDED SURFACE WATER.

REMEDIAL ACTION TARGET LEVELS FOR AFFECTED SURFACE SOILS AND LAGOON SLUDGES WERE ESTABLISHED THROUGH THE BASELINE RISK ASSESSMENT DISCUSSED IN SECTION 6.0 OF THIS DOCUMENT. THESE SOIL REMEDIAL ACTION TARGET LEVELS ARE DELINEATED IN SECTION 9.1 OF THIS DOCUMENT. THE REMEDIAL ACTION TARGET LEVELS ARE BASED ON THE UNLIMITED EXPOSURE SCENARIO WHICH ESTABLISHES A MAXIMUM RISK LEVEL OF 1×10^{-6} FOR CARCINOGENS, EXCEPT THE TARGET LEVEL FOR ARSENIC WHICH IS BASED ON A RISK LEVEL OF 1×10^{-5} AND A HAZARD INDEX OF 0.3 FOR NON-CARCINOGENS, BASED ON POTENTIAL EXPOSURE TO THREE NON-CARCINOGENS AT ONE TIME (HI/3). THE UNLIMITED EXPOSURE SCENARIO ASSUMES AN EXPOSURE FREQUENCY OF 365 DAYS/YEAR AND 50 PERCENT OF SOIL INCIDENTALLY INGESTED EACH DAY OF EXPOSURE. A PLAN VIEW OF THE REMEDIAL ACTION LIMITS INCLUDING THE TRUCK TURNAROUND AREA AND DRAINAGE SWALE ARE DELINEATED IN FIGURE 9. WASTE CROSS-SECTIONS INDICATING THE EXCAVATION LIMITS OF REMEDIAL ACTIVITIES ARE ILLUSTRATED ON FIGURES 10 AND 11.

SURFACE AREAS AND VOLUMES OF AFFECTED MATERIALS WERE ESTIMATED USING DATA OBTAINED DURING THE RI. THE ESTIMATED VOLUME OF SOIL HAVING WASTE CONSTITUENT CONCENTRATIONS EXCEEDING REMEDIAL ACTION TARGET LEVELS IS 24,400 CUBIC YARDS BASED ON UNLIMITED EXPOSURE TO THE WASTE MANAGEMENT AREA. THE ESTIMATED VOLUME OF SLUDGE IS 4,200 CUBIC YARDS. THE ESTIMATED VOLUME OF IMPOUNDED SURFACE WATER IN THE LAGOONS IS APPROXIMATELY 1.9 MILLION GALLONS.

INVESTIGATION OF THE ABANDONED DRUM AREA ON THE EASTERN SIDE OF THE RICE FARM INDICATED THAT CONCENTRATIONS OF CADMIUM AND CHROMIUM EXCEEDED

REMEDIAL ACTION TARGET LEVELS IN ONE SAMPLE. THE EXTENT OF THIS CONTAMINATION SHALL BE FURTHER DEFINED DURING THE REMEDIAL DESIGN/REMEDIAL ACTION (RD/RA) PHASE OF THIS PROJECT. IT IS EXPECTED THAT THE VOLUME OF THIS MATERIAL REQUIRING REMEDIATION WILL NOT

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SIGNIFICANTLY INCREASE THE VOLUMES NOTED ABOVE.

THESE MATERIAL VOLUMES AND THE LOCATIONS IN WHICH THE MATERIALS WERE FOUND WERE USED TO SELECT APPLICABLE REMEDIAL TECHNOLOGIES FOR FURTHER CONSIDERATION, AND TO ELIMINATE THOSE TECHNOLOGIES THAT COULD NOT BE TECHNICALLY JUSTIFIED FOR IMPLEMENTATION AT THE SITE. THE LIST OF TECHNOLOGIES THAT WERE IDENTIFIED THROUGH THIS SCREENING PROCESS WERE USED TO ASSEMBLE EIGHT ALTERNATIVES REPRESENTING A RANGE OF NO ACTION, CONTAINMENT AND TREATMENT TECHNOLOGIES.

IN PHASE II, SPECIFIC COMPONENTS OF EACH REMEDIAL ALTERNATIVE WERE DESCRIBED IN GREATER DETAIL TO EVALUATE THE REMEDIAL ALTERNATIVES ACCORDING TO EFFECTIVENESS, IMPLEMENTABILITY, AND COST. FOLLOWING THIS SCREENING PROCESS, SEVEN OF THE ORIGINAL EIGHT WERE RETAINED FOR FURTHER CONSIDERATION IN PHASE III OF THE FS.

PHASE III CONSISTED OF A DETAILED EVALUATION OF THE REMEDIAL ALTERNATIVES BASED ON THE FOLLOWING NINE CRITERIA:

- 1) OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT,
- 2) COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS),
- 3) LONG-TERM EFFECTIVENESS AND PERMANENCE,
- 4) REDUCTION OF TOXICITY, MOBILITY, AND VOLUME,
- 5) SHORT-TERM EFFECTIVENESS,
- 6) IMPLEMENTABILITY,
- 7) COST,
- 8) STATE/SUPPORT AGENCY ACCEPTANCE, AND
- 9) COMMUNITY ACCEPTANCE.

PHASE III OF THE FS ALSO INCLUDED A COMPARATIVE ANALYSIS OF THE REMAINING REMEDIAL ALTERNATIVES, WHICH COMPARED THE ALTERNATIVES WITH EACH OTHER.

COMMON ELEMENTS

ALTERNATIVES 2 THROUGH 8 INCLUDE. THE ESTABLISHMENT OF ALTERNATE CONCENTRATION LIMITS FOR THE OBSERVED, INTERMITTENT MCL EXCEEDANCES OF

LEAD, CHROMIUM, 1,2-DICHLOROPROPANE, AND 1,2-DICHLOROETHANE IN THE GROUND WATER AND THE ASSOCIATED LONG-TERM GROUND WATER MONITORING PROGRAM.

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ALTERNATIVES 3 THROUGH 8 ALSO INCLUDE THE COLLECTION AND DISCHARGE OF SURFACE WATER IMPOUNDED IN THE WASTE LAGOONS TO THE LOCAL POTW. BASED ON PRELIMINARY COMMUNICATIONS WITH THE WESTERN CAROLINA REGIONAL SEWER AUTHORITY (WCRSA) AND METROPOLITAN SEWER DISTRICT (MSD), WCRSA AND MSD OFFICIALS AGREE TO ACCEPT DISCHARGE FROM THE GSST SITE CONSISTENT WITH WCRSA'S EFFLUENT DISCHARGE STANDARDS. PRETREATMENT OF THE DISCHARGE WOULD BE REQUIRED IF CONSTITUENTS EXCEED WCRSA'S STANDARDS. RI DATA INDICATE THAT PRETREATMENT WILL NOT BE REQUIRED.

THE FOLLOWING SUB-SECTIONS FURTHER DESCRIBE THE EIGHT ALTERNATIVES DEVELOPED AND EVALUATED IN THE FS TO ADDRESS THE LAGOON SLUDGES, AND SURFACE AND SUBSURFACE SOILS IN THE IMMEDIATE VICINITY OF THE WASTE MANAGEMENT AREA.

ALTERNATIVE 1 - NO ACTION

IN ACCORDANCE WITH THE NCP, EPA HAS EVALUATED A "NO ACTION" ALTERNATIVE AS PART OF THE FS. THE NO ACTION ALTERNATIVE SERVES AS A BASIS AGAINST WHICH OTHER ALTERNATIVES CAN BE COMPARED. UNDER THE NO ACTION ALTERNATIVE, NO REMEDIAL RESPONSE WOULD BE PERFORMED ON ANY OF THE MEDIA OF CONCERN (SURFACE SOIL, LAGOON SLUDGE AND LAGOON WATER) I AT THE SITE. WASTE DISPOSAL AREAS, AS DEFINED DURING THE RI, WOULD I REMAIN IN THEIR PRESENT CONDITION.

THE ONLY ACTIVE COMPONENT OF THIS ALTERNATIVE IS LONG-TERM GROUND I WATER, SURFACE SOIL, AND SEDIMENT MONITORING. THIS PROGRAM WOULD BE IMPLEMENTED TO ASSESS THE EFFECT OF WASTE CONSTITUENTS ON THE SITE OVER A 30-YEAR DESIGN LIFE. GROUND WATER QUALITY AT THE SITE WOULD BE MONITORED SEMIANNUALLY FOR VOLATILE ORGANIC COMPOUNDS, 1 SEMI-VOLATILE ORGANICS AND INORGANICS. SURFACE SOIL AND SEDIMENT MONITORING WOULD BE PERFORMED ANNUALLY FOR THE SAME CONSTITUENTS TO EVALUATE ANY POSSIBLE MIGRATION OF WASTE CONSTITUENTS.

SINCE THIS REMEDY RESULTS IN HAZARDOUS WASTE REMAINING ON-SITE WHICH WILL NOT ALLOW UNLIMITED USE AND UNRESTRICTED EXPOSURE, CERCLA REQUIRES THAT THE SITE BE REVIEWED EVERY FIVE YEARS. DURING THIS REVIEW, THE MONITORING PROGRAM WOULD BE RE-EVALUATED TO ASSESS THE APPROPRIATENESS OF THE SAMPLING PROGRAM.

THIS ALTERNATIVE DOES NOT REDUCE THE RISK CALCULATED BY THE BASELINE RISK ASSESSMENT. THE NO ACTION ALTERNATIVE RESULTS IN AN EXCESS 1 CANCER RISK OF $2.3 \times (10^{-5})$ AND A HAZARD INDEX FOR NON-CARCINOGENIC EFFECTS OF 8.2 FOR CURRENT LAND USE, WHICH ARE CONSIDERED 1 UNACCEPTABLE RISK LEVELS BY THE EPA.

THE ESTIMATED PRESENT-WORTH, INCLUDING 30-YEAR O&M COSTS, OF ALTERNATIVE

1 IS \$1,300,000. THIS INCLUDES \$60,000 OF CAPITAL FOR ENGINEERING DESIGN SERVICES AND APPROXIMATELY \$83,000 ANNUAL MONITORING COSTS.

ALTERNATIVE 2 - INSTITUTIONAL CONTROLS

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THE INSTITUTIONAL CONTROLS ALTERNATIVE ESTABLISHES INSTITUTIONAL MEASURES TO BLOCK POSSIBLE WASTE CONSTITUENT EXPOSURE PATHWAYS THROUGH THE AFFECTED MEDIA: SOIL, SLUDGE AND LAGOON SURFACE WATER. THESE INSTITUTIONAL CONTROLS INCLUDE THE FOLLOWING:

- * FENCING TO LIMIT ACCESS TO AFFECTED SOLID MATERIALS AND SURFACE IMPOUNDMENTS; AND
- * A CONSERVATION EASEMENT, OR DEED RESTRICTION, TO CONTROL THE USE OF AFFECTED GROUND WATER AND FUTURE DEVELOPMENT OF THE SITE.

UNDER THIS ALTERNATIVE, THOSE AREAS OF THE SITE CONTAINING SOILS AND SLUDGE WITH WASTE CONSTITUENT CONCENTRATIONS EXCEEDING REMEDIAL ACTION TARGET CONCENTRATIONS WOULD BE FENCED. THE FENCE WOULD CONSIST OF A SIX-FOOT HIGH CHAIN LINK FENCE WITH AT LEAST ONE STRAND OF BARBED WIRE EXTENDING ALONG THE TOP. THE SITE WOULD BE POSTED AND GATES WOULD BE KEPT LOCKED.

IN ADDITION TO FENCING, LEGAL ACTIONS WOULD BE TAKEN TO PROVIDE A PERMANENT EASEMENT RESTRICTING ACCESS AND FUTURE SITE USE. THE CONSERVATION EASEMENT WILL GRANT CONTROL OF THE LAND IN PERPETUITY TO A THIRD PARTY AND PROHIBIT FURTHER DEVELOPMENT OF THE PROPERTY. THE CONSERVATION EASEMENT COULD BE GRANTED WELL IN ADVANCE OF ANY REMEDIAL ACTION AT THE SITE.

THERE ARE NO CHEMICAL-SPECIFIC, ACTION-SPECIFIC, OR LOCATION-SPECIFIC ARARS FOR THE CONSTITUENTS OF CONCERN IN SOIL, IF LEFT IN PLACE. HOWEVER, CONCENTRATIONS IN THE SOIL AND SLUDGE WOULD REMAIN ELEVATED ABOVE REMEDIAL ACTION TARGET LEVELS THAT ARE DEEMED PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT. THE IMPOUNDED WATER IN THE TWO EXISTING LAGOONS WILL NOT ATTAIN ARARS FOR SURFACE WATER DUE TO THE REPORTED CONCENTRATIONS OF CADMIUM, CHROMIUM, COPPER, IRON, MANGANESE, AND ZINC WHICH EXCEED WATER QUALITY CRITERIA FOR FRESH WATER AQUATIC LIFE, FOR HUMAN EXPOSURE, OR FOR BOTH.

REVIEW OF THE SITE WOULD BE CONDUCTED EVERY FIVE YEARS SINCE HAZARDOUS SUBSTANCES ARE REMAINING ON SITE AND WILL NOT ALLOW FOR UNLIMITED USE AND UNRESTRICTED EXPOSURE.

THIS ALTERNATIVE REDUCES THE INCREMENTAL RISK FOR CURRENT SITE CONDITIONS BY RESTRICTING ACCESS TO THE AFFECTED MEDIA AND BY PREVENTING FUTURE LAND USES THAT WOULD ALLOW REPEATED, FREQUENT CONTACT WITH THE AFFECTED MEDIA. IMPLEMENTATION OF INSTITUTIONAL CONTROLS AT THE SITE WOULD REDUCE THE SITE CARCINOGENIC RISK LEVEL FROM

2.3 X (10⁻⁵) TO 1 X (10⁻⁵), AND THE HAZARD INDEX FOR NONCARCINOGENS FROM 8.2 TO 0.14. THE RESULTING RISK ASSESSMENT CONSIDERS ONLY THOSE CONSTITUENTS IN SOIL SAMPLES COLLECTED BEYOND THE AREA THAT WOULD BE FENCED, SINCE THE FENCE WILL PREVENT DIRECT CONTACT WITH THE LAGOONS.

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ENVIRONMENTAL MONITORING SIMILAR TO THAT DISCUSSED UNDER ALTERNATIVE 1 WOULD ALSO BE CONDUCTED AS PART OF THIS ALTERNATIVE. THE CAPITAL COST ASSOCIATED WITH THIS ALTERNATIVE IS \$81,000 WITH ANNUAL COSTS OF \$83,000. THE TOTAL ESTIMATED PRESENT-WORTH COST FOR IMPLEMENTATION OF INSTITUTIONAL CONTROLS IS \$1,400,000.

ALTERNATIVE 3 - CONTAINMENT OF SOILS AND SLUDGES

THIS ALTERNATIVE COMBINES THE INSTITUTIONAL ACTIONS OUTLINED FOR SOLID WASTE MATERIALS DESCRIBED IN ALTERNATIVE 2 WITH CONTAINMENT OF AFFECTED SOLID WASTE MATERIALS BY CAPPING. THIS ALTERNATIVE WOULD CONTAIN, IN-PLACE, THE TOTAL VOLUME OF AFFECTED SOLIDS.

CONTAINMENT WOULD LEAVE AFFECTED SOILS IN PLACE WITH LITTLE OR NO DISTURBANCE. A CAP OVER AFFECTED MATERIALS AT THE SURFACE WOULD MINIMIZE CONTACT BETWEEN PERCOLATING WATER AND WASTE CONSTITUENTS, THEREBY REDUCING THE POTENTIAL FOR MIGRATION OF WASTE CONSTITUENTS TO THE GROUNDWATER. IN ADDITION, A CAP INSTALLED OVER THE AFFECTED MATERIALS WOULD PREVENT EROSION OF WASTE CONSTITUENTS BY WIND OR SURFACE WATER RUNOFF. A CONTAINMENT COVER OF THIS TYPE WOULD REQUIRE PERIODIC MAINTENANCE AND INSPECTION. THE CAP WOULD COVER THE SOILS WITH WASTE CONSTITUENT CONCENTRATIONS EXCEEDING THE SURFACE SOIL REMEDIAL ACTION TARGETS. THE TOTAL AREA OF THE CAP WOULD BE 7.4 ACRES. APPROXIMATELY 10 ACRES WOULD BE DISTURBED BY CONSTRUCTION ACTIVITIES.

TWO DESIGNS WERE CONSIDERED FOR A CONTAINMENT COVER UNDER THIS ALTERNATIVE:

OPTION 3A - COMPOSITE COVER

THE COMPOSITE COVER OPTION WOULD INVOLVE DESIGN OF A CAP CONSISTING OF THE FOLLOWING COMPONENTS:

- * 6 INCHES OF TOPSOIL
- * 12 INCHES OF UNAFFECTED NATIVE SOILS
- * 2 FEET OF COMPACTED CLAY
- * A LAYER OF GEOTEXTILE MATERIAL

THE CLAY LAYER WOULD BE COMPACTED TO REDUCE THE PERMEABILITY TO LESS THAN OR EQUAL TO THE PERMEABILITY OF THE SUBSOILS BELOW THE LAGOONS AS REQUIRED BY SOUTH CAROLINA HAZARDOUS WASTE REGULATIONS. THE FINAL SURFACE CONTOURS OF THE CAP WOULD BE GRADED TO PROMOTE RUNOFF AND REDUCE INFILTRATION DURING RAINFALL EVENTS.

THE COMPOSITE COVER WOULD BE SOWN WITH SHALLOW-ROOTED GRASSES TO MINIMIZE CAP EROSION. GRASSES WOULD BE SELECTED TO MINIMIZE POSSIBLE

PENETRATION OF THE PROTECTIVE CLAY LAYER BY THE ELEMENTS.

OPTION 3B - MULTIMEDIA COVER

THE MULTIMEDIA COVER OPTION WOULD INCLUDE CAP DESIGN CONSISTING OF THE

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FOLLOWING COMPONENTS:

- * 6 INCHES OF TOPSOIL
- * 18 INCHES OF UNAFFECTED SOIL
- * 1 LAYER OF GEOTEXTILE FABRIC
- * 1 LAYER OF DRAINAGE MATERIAL
- * 1 LAYER OF FLEXIBLE MEMBRANE LINER
- * 2 FEET OF CLAY

THE MULTIMEDIA COVER DESIGN COMPLIES WITH SCDHEC REQUIREMENTS FOR HAZARDOUS WASTE COVER SYSTEMS AND WOULD BE DESIGNED TO PERFORM IN ACCORDANCE WITH EPA MINIMUM TECHNOLOGY GUIDANCE. LIKE THE COMPOSITE COVER OPTION, THE MULTIMEDIA COVER WOULD BE GRADED TO PROMOTE SURFACE DRAINAGE AND SOWN WITH SHALLOW-ROOTED GRASSES.

THE SOIL COVER WILL COMPLY WITH THE RCRA ACTION-SPECIFIC REQUIREMENTS FOR CAPPING SOLID WASTES IN PLACE. THE COVER WOULD BE DESIGNED TO DIVERT SURFACE WATER RUNOFF FROM A 24-HOUR, 25-YEAR STORM. A VEGETATIVE TOPSOIL LAYER WILL REDUCE EROSION AND PROTECT THE INTEGRITY OF THE CLAY BARRIER. CLOSURE CAPS SUCH AS THIS ALSO MEET THE REMEDIAL ACTION OBJECTIVES OF ELIMINATING THE POTENTIAL FOR DERMAL EXPOSURE AND INCIDENTAL INGESTION OF SURFACE SOILS AND SLUDGE. ADDITIONALLY, SURFACE WATER IN THE LAGOONS WILL BE COLLECTED AND DISCHARGED TO THE LOCAL SEWER AUTHORITY FOR TREATMENT. SURFACE WATER ARARS WILL, THEREFORE, BE ATTAINED.

CONTAINMENT OF AFFECTED SOLIDS REDUCES THE INCREMENTAL RISK CALCULATED FOR CURRENT SITE CONDITIONS BY PREVENTING DIRECT CONTACT WITH AFFECTED MATERIALS HAVING WASTE CONSTITUENT CONCENTRATIONS THAT EXCEED REMEDIAL ACTION TARGET LEVELS. CONSTRUCTION OF THE CAP OVER THE AFFECTED SOILS WOULD REDUCE THE SITE CARCINOGENIC RISK LEVEL FROM $2.3 \times (10^{-5})$ FOR CURRENT LAND USE TO $1 \times (10^{-5})$, AND THE HAZARD INDEX FOR CARCINOGENIC EFFECTS WOULD DECREASE FROM 8.2 TO 0.14. THESE ARE CONSIDERED ACCEPTABLE RISK LEVELS BY THE EPA.

SINCE HAZARDOUS MATERIALS WILL BE CONTAINED ON SITE, A REVIEW OF THE SITE WILL BE CONDUCTED EVERY FIVE YEARS. THE REVIEW WOULD FOCUS ON WHETHER THE CAP REMAINS EFFECTIVE, THE INSTITUTIONAL CONTROLS REMAIN IN PLACE, AND IF PROTECTIVENESS IS BEING ASSURED THROUGH EXPOSURE PROTECTION.

CONSTRUCTION OF THIS REMEDIAL ALTERNATIVE IS ESTIMATED TO REQUIRE 15 MONTHS TO IMPLEMENT, ALLOWING TIME FOR DESIGN, BIDDING, CONSTRUCTION, AND UNFORESEEN DOWNTIME DURING SITE ACTIVITIES.

CAPITAL COSTS FOR BOTH CAP OPTIONS ARE APPROXIMATELY \$2,200,000 WITH

ANNUAL COSTS OF \$65,000 FOR MONITORING. THE ESTIMATED PRESENT-WORTH COSTS FOR OPTIONS 3A AND 3B OF THIS ALTERNATIVE, INCLUDING 30-YEAR O&M COSTS, ARE \$3,200,000 AND \$3,500,000, RESPECTIVELY.

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ALTERNATIVE 4 - STABILIZATION AND OFF-SITE DISPOSAL OF
SOILS AND SLUDGES

ALTERNATIVE 4 CONSISTS OF THE INSTITUTIONAL CONTROLS DESCRIBED IN ALTERNATIVE 2, EXCAVATION OF AFFECTED SOILS AND SLUDGE MATERIALS, AND OFF-SITE DISPOSAL IN A SECURE RESOURCE, CONSERVATION AND RECOVERY ACT (RCRA) LANDFILL.

THIS ALTERNATIVE INCLUDES THE REMOVAL OF ALL AFFECTED SOLIDS WITH WASTE CONSTITUENT CONCENTRATIONS EXCEEDING ESTABLISHED SURFACE SOIL REMEDIAL ACTION TARGET LEVELS. THE VOLUME TO BE EXCAVATED WOULD BE APPROXIMATELY 28,600 CUBIC YARDS. THE EXTENT OF EXCAVATION WOULD BE DETERMINED BY COLLECTION AND ANALYSES OF CONFIRMATION SAMPLES FROM UNDERLYING SOILS AFTER THE REMOVAL OF THE SLUDGE AND VISIBLY-AFFECTED SOILS. PRIOR TO EXCAVATION, A SAMPLING PROGRAM WOULD BE CONDUCTED TO DETERMINE THE ACTUAL VOLUMES OF SURFACE SOIL AND OVERBURDEN REQUIRING REMEDIAL ACTION.

EXCAVATED WASTES WOULD BE TRANSPORTED TO A FACILITY SUCH AS THE LAIDLAW (GSX) FACILITY IN PINWOOD, SOUTH CAROLINA. THIS FACILITY IS IN COMPLIANCE WITH ALL APPLICABLE FEDERAL AND STATE HAZARDOUS WASTE REQUIREMENTS AND HAS THE CAPACITY NECESSARY TO ACCOMMODATE THE ESTIMATED VOLUME OF WASTE. THE SELECTED WASTE TRANSPORTER WOULD BE IN FULL COMPLIANCE WITH APPLICABLE FEDERAL AND STATE ENVIRONMENTAL AND PUBLIC HEALTH STATUTES. VEHICLES TRANSPORTING FROM THE SITE WOULD ALSO BE APPROVED BY THE DEPARTMENT OF TRANSPORTATION (DOT), DISPLAY THE PROPER PLACARD, AND CARRY THE PROPER MANIFESTS.

THE LAGOON AREAS WOULD BE CLOSED BY GRADING THE EXCAVATIONS TO PROMOTE DRAINAGE, COVERING WITH A LAYER OF TOPSOIL, AND SEEDING TO ESTABLISH VEGETATIVE GROWTH. INSTITUTIONAL CONTROLS WOULD BE IMPLEMENTED BY INCORPORATION OF A CONSERVATION EASEMENT AND DEED RESTRICTIONS TO RESTRICT FUTURE LAND USES IN THE WASTE MANAGEMENT AREA.

ACTION-SPECIFIC ARARS, IN PARTICULAR THE LAND DISPOSAL RESTRICTIONS OF 40 CFR PART 268, WILL BE MET BY STABILIZATION OF THE EXCAVATED SOILS PRIOR TO LEAVING THE SITE SO THAT REGULATORY LIMITS FOR CHARACTERISTIC WASTES ARE MET. THE POTENTIAL RECEIVING LANDFILL IS A SCDHEC AND EPA APPROVED SUBTITLE C HAZARDOUS WASTE LANDFILL THAT MEETS LOCATION-SPECIFIC ARARS. RESULTS OF TCLP ANALYSES OF THE SLUDGES AND AFFECTED SOILS INDICATE THAT CADMIUM CONCENTRATIONS IN THE LEACHATE MAY REQUIRE TREATMENT TO MEET THE APPLICABLE LDR STANDARD, FOR WHICH STABILIZATION IS THE BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT). SURFACE WATER IN THE LAGOONS WILL BE COLLECTED AND DISCHARGED TO THE LOCAL POTW FOR TREATMENT AND WILL ATTAIN SURFACE WATER ARARS.

EXCAVATION, TREATMENT, AND OFF-SITE DISPOSAL OF THE AFFECTED SOILS AND

SLUDGE COMBINED WITH THE INSTITUTIONAL CONTROLS FOR ALTERNATIVE 2, REDUCES THE INCREMENTAL RISK CALCULATED FOR THE BASELINE RISK ASSESSMENT. THIS ALTERNATIVE RESULTS IN A MAXIMUM CARCINOGENIC RISK LEVEL LESS THAN 1 X (10⁻⁵) AND A HAZARD INDEX LESS THAN 1.0.

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SINCE HAZARDOUS MATERIALS WILL NOT REMAIN ON-SITE, THE FIVE-YEAR REVIEW IS NOT APPLICABLE FOR THIS ALTERNATIVE.

EXCAVATION AND GRADING ACTIVITIES ASSOCIATED WITH THIS ALTERNATIVE COULD TAKE 12 MONTHS TO IMPLEMENT, ALLOWING TIME FOR DESIGN, BIDDING, EXCAVATION, AND UNFORESEEN DOWNTIME DURING EXCAVATION AND GRADING.

CAPITAL COSTS ASSOCIATED WITH THIS ALTERNATIVE ARE \$11,500,000 WITH ANNUAL COSTS OF \$65,000. THE ESTIMATED PRESENT-WORTH COST OF ALTERNATIVE 4 IS \$12,500,000.

ALTERNATIVE 5- STABILIZATION AND OFF-SITE DISPOSAL OF SLUDGE AND CAPPING OF SOILS

ALTERNATIVE 5 CONSISTS OF THE INSTITUTIONAL CONTROLS DESCRIBED IN ALTERNATIVE 2; EXCAVATION OF VISIBLE WASTES (SLUDGES) EXCEEDING ACCEPTABLE RISK LEVELS AND OFF-SITE DISPOSAL OF THESE MATERIALS IN A SECURE RCRA LANDFILL AS DESCRIBED IN ALTERNATIVE 4; AND CAPPING OF THE AFFECTED SOILS AS DESCRIBED IN ALTERNATIVE 3.

APPROXIMATELY 6,600 CUBIC YARDS OF SLUDGE AND OVERBURDEN WOULD BE EXCAVATED, STABILIZED TO MEET APPLICABLE LDR CONCENTRATION LIMITS, STOCKPILED, AND TRANSPORTED BY TRUCK TO THE LAIDLAW (GSX) FACILITY DISCUSSED IN ALTERNATIVE 4. THE SITE EXCAVATIONS WOULD BE FILLED BY PUSHING IN THE BERMS AND SURROUNDING SOILS. SLUDGE FROM THE TWO OPEN LAGOONS WOULD BE DEWATERED AND STOCKPILED WITH OTHER SOILS AND SLUDGE. EXCAVATION WOULD BE LIMITED TO THE REMOVAL OF MATERIALS VISIBLY IDENTIFIABLE AS SLUDGE, AND POSSIBLY SOME OVERBURDEN FROM THE BACKFILLED LAGOONS. SLUDGE AT THE SITE IS TYPICALLY A GREY-WHITE COLOR AND RANGES IN CONSISTENCY FROM A THICK PASTE IN THE WET LAGOONS TO A SOIL-LIKE TEXTURE IN THE BACKFILLED LAGOONS. THE OVERBURDEN WOULD BE SAMPLED TO DETERMINE IF WASTE CONSTITUENT CONCENTRATIONS EXCEED REMEDIAL ACTION TARGET LEVELS FOR SUBSURFACE SOILS.

AFTER COMPLETION OF THE EXCAVATION ACTIVITIES, A COMPOSITE CAP WOULD BE CONSTRUCTED OVER ALL DISPOSAL AREAS CONTAINING WASTE RESIDUALS HAVING CONCENTRATIONS THAT EXCEED THE TARGET LEVELS FOR SURFACE SOILS. THE AFFECTED AREA REQUIRING CONSTRUCTION OF A CAP AND COVER IS APPROXIMATELY 7.4 ACRES. THE SECURITY FENCE WOULD BE EXTENDED TO INCLUDE THOSE AREAS TO BE CAPPED THAT ARE CURRENTLY OUTSIDE THE FENCING, THEREBY PROVIDING AN ADDITIONAL LEVEL OF PROTECTIVENESS TO THE ALTERNATIVE.

ACTION-SPECIFIC ARARS, IN PARTICULAR THE LAND DISPOSAL RESTRICTIONS OF 40 CFR PART 268, WILL BE MET BY STABILIZATION OF THE EXCAVATED SLUDGE PRIOR TO LEAVING THE SITE SO THAT REGULATORY LIMITS FOR CHARACTERISTIC

WASTES ARE MET. ACTION-SPECIFIC ARARS WILL ALSO BE MET IN THE DESIGN AND CONSTRUCTION OF THE COMPOSITE CAP, WHICH COMPLY WITH RCRA REQUIREMENTS FOR CAPPING IN-PLACE, AS DESCRIBED IN ALTERNATIVE 3. THE RECEIVING LANDFILL IS A SCDHEC AND EPA APPROVED SUBTITLE C HAZARDOUS

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WASTE LANDFILL THAT MEETS LOCATION-SPECIFIC ARARS. SURFACE WATER IN THE LAGOONS WILL BE COLLECTED AND DISCHARGED TO THE LOCAL SEWER AUTHORITY FOR TREATMENT AND WILL ATTAIN SURFACE WATER ARARS.

OFF-SITE MANAGEMENT OF WASTES BY LANDFILLING WOULD NOT REDUCE THE TOXICITY OR VOLUME OF THE MATERIALS. HOWEVER, LONG-TERM MOBILITY OF WASTE CONSTITUENTS WOULD BE REDUCED. TRANSPORTING WASTES OFF-SITE COULD POTENTIALLY EXPOSE INDIVIDUALS USING THE SAME ROADS, OR LIVING OR WORKING ALONG THE ROUTE, TO AFFECTED GSST MATERIALS IN THE EVENT OF AN ACCIDENTAL SPILL OR RELEASE. A GREATER RISK IS PRESENTED BY THE AMOUNT OF TRAFFIC REQUIRED TO BRING THE CLAY FOR CAP CONSTRUCTION AND TO HAUL THE STABILIZED WASTE TO THE LANDFILL. THIS ALTERNATIVE REDUCES THE INCREMENTAL RISK, WHICH WAS CALCULATED FOR CURRENT SITE CONDITIONS, BY RESTRICTING ACCESS TO THE AFFECTED MEDIA AND BY PREVENTING FUTURE LAND USES THAT WOULD ALLOW REPEATED, FREQUENT CONTACT WITH THE AFFECTED MEDIA. IMPLEMENTATION OF ALTERNATIVE 5 WOULD REDUCE THE SITE CARCINOGENIC RISK LEVEL TO $1 \times (10^{-5})$, AND THE HAZARD INDEX FOR NONCARCINOGENS TO 0.14. THE RESULTING RISK ASSESSMENT CONSIDERS ONLY THOSE CONSTITUENTS IN SOIL SAMPLES COLLECTED BEYOND THE AREA THAT WOULD BE FENCED, SINCE THE FENCE AND CLAY CAP WILL PREVENT DIRECT CONTACT WITH THE LAGOONS. THE LIMITED EXPOSURE SCENARIO OF FUTURE LAND USE WAS USED TO ESTIMATE THE RESULTING RISKS.

A REVIEW OF THE COMPOSITE CAP PLACED OVER THE AFFECTED SURFACE SOILS WOULD TAKE PLACE EVERY FIVE YEARS TO ASSURE IT REMAINS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT.

CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS ALTERNATIVE COULD TAKE TWELVE MONTHS TO IMPLEMENT, ALLOWING TIME FOR DESIGN, BIDDING, CONSTRUCTION, AND DOWNTIME DURING CONSTRUCTION.

CAPITAL COSTS OF \$5,100,000 ARE ASSOCIATED WITH THIS ALTERNATIVE. ANNUAL COSTS OF \$65,000 FOR 30-YEAR O&M ARE ALSO REQUIRED. THE TOTAL ESTIMATED PRESENT-WORTH COST OF ALTERNATIVE 5 IS \$6,100,000.

ALTERNATIVE 6 - EXCAVATION AND ON-SITE DISPOSAL OF SOILS AND SLUDGES

THE COMPONENTS OF THIS ALTERNATIVE INCLUDE THE INSTITUTIONAL CONTROLS DESCRIBED IN ALTERNATIVE 2 AND EXCAVATION AND DISPOSAL OF AFFECTED SOILS AND SLUDGES. SLUDGE FROM THE LAGOONS WOULD BE DREDGED AND DEWATERED. DEWATERED SLUDGE WOULD BE COMBINED WITH AFFECTED SOILS, WHILE FILTRATE LIQUIDS WOULD BE COMBINED WITH THE COLLECTED LAGOON WATER FOR DISCHARGE TO THE POTW. SOILS THAT CONTAIN CONSTITUENTS EXCEEDING ESTABLISHED SURFACE SOIL TARGET CONCENTRATIONS WOULD BE EXCAVATED AND TRANSPORTED TO AN ON-SITE RCRA LAND DISPOSAL UNIT. THE RCRA LAND-DISPOSAL UNIT WOULD

BE DESIGNED AND CONSTRUCTED SPECIFICALLY FOR THE DISPOSAL OF DEWATERED SLUDGES AND AFFECTED SOILS WITH CONSTITUENTS EXCEEDING THE SURFACE SOIL CONCENTRATIONS. A LANDFILL CLOSURE WOULD BE IMPLEMENTED SOON AFTER THE DISPOSAL ACTION WAS COMPLETED. THE LAGOON AREAS WOULD BE CLOSED BY

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GRADING TO PROVIDE PROPER DRAINAGE, FOLLOWED BY SEEDING TO MINIMIZE EROSION.

THE ON-SITE, DOUBLE-LINED LANDFILL CONSTRUCTED FOR DISPOSAL OF AFFECTED SOLIDS WOULD HAVE A CAPACITY OF 50,000 CUBIC YARDS. LANDFILL DIMENSIONS WOULD BE APPROXIMATELY 235 FEET BY 235 FEET AT GRADE. THE DEPTH OF THE LANDFILL EXCAVATION BELOW GROUND SURFACE WOULD BE APPROXIMATELY 15 FEET, AND THE BERM HEIGHT AROUND THE LANDFILL WOULD ALSO BE APPROXIMATELY 15 FEET. THE LANDFILL WOULD BE CONSTRUCTED ACCORDING TO REGULATORY REQUIREMENTS OF THE STATE OF SOUTH CAROLINA AND THE EPA. THESE REQUIREMENTS INCLUDE CONSTRUCTION OF A DOUBLE LINER WITH A LEACHATE COLLECTION SYSTEM ABOVE AND BETWEEN THE LINERS. THE TOP LINER WOULD BE DESIGNED TO PREVENT THE MIGRATION OF WASTE CONSTITUENTS INTO THE LOWER LINER. THE BOTTOM LINER WOULD BE DESIGNED TO PREVENT MIGRATION OF WASTE CONSTITUENTS. SOUTH CAROLINA CODES REQUIRE A MINIMUM OF A THREE-FOOT THICK LAYER OF RECOMPACTED CLAY OR OTHER NATURAL MATERIAL AS A BOTTOM LINER. THE PERMEABILITY MUST BE NO MORE THAN $1 \times (10^{-7})$ CENTIMETERS PER SECOND. THE LANDFILL CAP IS REQUIRED TO BE LESS PERMEABLE THAN THE SOILS IMMEDIATELY BELOW THE LANDFILL.

LANDFILL OPERATION AND MAINTENANCE (O & M) WOULD INCLUDE A NUMBER OF TASKS NECESSARY TO PROTECT THE INTEGRITY OF THE LAND DISPOSAL UNIT. SEMIANNUAL INSPECTIONS AND PERIODIC MAINTENANCE WOULD BE NEEDED ON THE SITE ACCESS ROAD, THE SECURITY FENCING, THE LEACHATE COLLECTION AND TREATMENT SYSTEM, AND THE LANDFILL CAP AND COVER, WHICH IS EXPECTED TO COVER APPROXIMATELY 2.7 ACRES.

THE LONG-TERM EFFECTIVENESS OF THIS ALTERNATIVE WOULD BE PROVIDED BY PROPER MAINTENANCE OF THE ON-SITE LANDFILL. WHEN COMPARED TO CAPPING AFFECTED MATERIALS IN PLACE, REMOVAL AND LANDFILLING ON-SITE OFFERS NO GREATER EFFECTIVENESS FOR VOLUME OR TOXICITY REDUCTION. THE MOBILITY OF WASTE CONSTITUENTS WILL BE DECREASED BY PLACEMENT IN A SECURE LANDFILL. THE EXCAVATION OF AFFECTED SOILS AND SLUDGES TO SURFACE SOIL TARGETS WOULD RESULT IN A MAXIMUM EXPOSURE FOR LIFETIME EXCESS CANCER RISK LESS THAN $1 \times (10^{-5})$ AND A HAZARD INDEX LESS THAN 1.0, WHICH ARE THE CRITERIA ESTABLISHED FOR THE RISK-BASED REMEDIAL ACTION TARGET CONCENTRATIONS.

THE ADMINISTRATIVE FEASIBILITY OF CONSTRUCTING A HAZARDOUS WASTE LANDFILL ON-SITE AT GSST FOR STORAGE OF LAGOON SLUDGES AND AFFECTED SOILS IS DOUBTFUL. AT GSST, THE LIKELY BUFFER TO RESIDENTIAL DWELLINGS WOULD BE APPROXIMATELY 300 FEET, AND THE AVERAGE DEPTH TO THE WATER TABLE IN THE AREA CHOSEN FOR THE ON-SITE LANDFILL IS APPROXIMATELY 5 TO 25 FEET BELOW LAND SURFACE. THESE TWO FACTORS MAKE THE ACCEPTABILITY OF INSTALLING A LANDFILL FACILITY AT THE GSST SITE DOUBTFUL.

TOTAL CAPITAL COSTS OF THIS ALTERNATIVE ARE \$5,888,000 WITH ANNUAL

MONITORING COSTS OF \$69,500. THE ESTIMATED PRESENT-WORTH COST OF ALTERNATIVE 6 IS \$7,000,000.

ALTERNATIVE 7 - TREATMENT AND ON-SITE DISPOSAL OF SOILS

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AND SLUDGES

ALTERNATIVE 7 CONSISTS OF EXCAVATION OF AFFECTED SOLID MATERIALS AS DESCRIBED IN ALTERNATIVE 4; TREATMENT OF AFFECTED SOLID MATERIALS USING EITHER VITRIFICATION, SOIL WASHING, OR STABILIZATION; AND BACKFILLING OF TREATED RESIDUALS INTO THE EXCAVATIONS.

THE FOLLOWING THREE PROCESS OPTIONS WERE DEVELOPED AND SELECTED BASED ON COMMERCIAL AVAILABILITY AND/OR A HISTORY OF PRIOR APPLICATION TO SIMILAR METAL-BEARING WASTES:

OPTION 7A: THERMAL TREATMENT - VITRIFICATION
OPTION 7B: PHYSICAL SEPARATION - SOIL WASHING
OPTION 7C: PHYSICAL STABILIZATION - SOLIDIFICATION/FIXATION

FOR THE SOLID WASTE MATERIALS, THE FIRST STEP IN THIS ALTERNATIVE WOULD INCLUDE THE EXCAVATION OF SLUDGE AND AFFECTED SOILS HAVING WASTE CONSTITUENT CONCENTRATIONS EXCEEDING SOIL TARGET CONCENTRATIONS. FOLLOWING EXCAVATION, THE AFFECTED MATERIALS WOULD BE TEMPORARILY STOCKPILED FOR PROCESSING PRIOR TO TREATMENT. THE SOLID WASTE MATERIAL REQUIRING TREATMENT IS ESTIMATED TO CONSIST OF APPROXIMATELY 22,400 IN-PLACE CUBIC YARDS (28,000 LOOSE CUBIC YARDS) OF AFFECTED SOIL AND SLUDGE. A SAMPLING PROGRAM WOULD BE CONDUCTED PRIOR TO EXCAVATION TO DETERMINE THE ACTUAL VOLUMES OF SURFACE SOILS AND OVERBURDEN REQUIRING REMEDIAL ACTION. TREATMENT OF SOILS AND SLUDGE WOULD BE REQUIRED TO MEET THE LIMITS IMPOSED BY THE RCRA LAND DISPOSAL RESTRICTIONS. TREATED SOLIDS WOULD BE DISPOSED OF BY BACKFILLING THE EXCAVATIONS. A ONE-FOOT LAYER OF UNAFFECTED NATIVE SOIL, AND A SIX-INCH LAYER OF TOPSOIL WOULD BE PLACED ON TOP OF THE TREATED RESIDUALS. THE TOPSOIL WOULD BE SOWN WITH SHALLOW-ROOTED GRASSES TO MINIMIZE EROSION.

OPTION 7A: THERMAL TREATMENT - VITRIFICATION

THIS OPTION INCLUDES THE USE OF A TRANSPORTABLE VITRIFICATION UNIT THAT WOULD BE LOCATED AT THE SITE BY A COMMERCIAL VENDOR. THE UNIT WOULD BE REQUIRED TO MEET THE SUBSTANTIVE REQUIREMENTS OF ALL APPLICABLE FEDERAL OR STATE PERMIT CONDITIONS. THIS SYSTEM WOULD CONSIST OF THE FOLLOWING UNIT OPERATIONS:

- * MATERIAL PREPROCESSING/SORTING
- * VITRIFICATION UNIT
- * HOOD FOR COLLECTING GASES AND FUMES
- * SCRUBBER WATER TREATMENT

MOBILIZATION AND STARTUP OF THIS SYSTEM MAY REQUIRE MORE THAN TWO YEARS. STARTUP TESTING OF THE SYSTEM PRIOR TO FULL-SCALE OPERATION MAY ALSO

REQUIRE SEVERAL MONTHS TO COMPLETE. ASSUMING AN OPERATION OF 10 HOURS PER DAY, 5 DAYS PER WEEK, VITRIFICATION OF 22,400 CUBIC YARDS WOULD REQUIRE APPROXIMATELY 130 WEEKS OF OPERATION.

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THE VITRIFICATION PROCESS HAS DEMONSTRATED LIMITED SUCCESS WITH THE MORE VOLATILE METALS, SUCH AS ARSENIC, CADMIUM, LEAD AND MERCURY. ARSENIC AND CADMIUM WERE IDENTIFIED IN SIGNIFICANT QUANTITIES AT THE SITE BY THE RI. VITRIFICATION TECHNOLOGY HAS PROVEN THAT 85-90 PERCENT OF THE ARSENIC AND 50-60 PERCENT OF THE CADMIUM CAN BE RETAINED IN THE VITRIFIED MONOLITH. THE VITRIFICATION SYSTEM WOULD BE EQUIPPED WITH AN AIR SCRUBBER SYSTEM TO REDUCE THE EMISSION OF THESE METALS IN THE EXHAUST GASES. STATE TOXICS REQUIREMENTS WOULD HAVE TO BE MET BY EMISSIONS FROM THE VITRIFICATION PROCESS.

OPTION 7B: PHYSICAL SEPARATION - SOIL WASHING

SOIL WASHING IS A BATCH PROCESS IN WHICH SOILS OR SLUDGES ARE THOROUGHLY MIXED WITH SUCCESSIVE RINSE SOLUTIONS FORMULATED TO REMOVE AMENABLE FRACTIONS OF WASTE CONSTITUENTS FROM THE SOILS AND INERT PARTICLES. ACID RINSES ARE FREQUENTLY USED TO SOLUBILIZE METALS, TRANSFERRING THE METALS FROM A SOLID OR SORBED STATE TO AN AQUEOUS PHASE. THE AQUEOUS PHASE IS THEN SEPARATED FROM THE SOLID MATRIX BY DECANTING. THE RINSATE FROM THIS STEP IS THEN TREATED USING CONVENTIONAL WASTEWATER TECHNOLOGY FOR METALS REMOVAL, SUCH AS PH ADJUSTMENT, FLOCCULATION, CLARIFICATION, AND DEWATERING. A SOIL WASHING SYSTEM WOULD CONSIST OF THE FOLLOWING UNIT OPERATIONS:

- * MATERIAL PROCESSING/SORTING
- * REAGENT STORAGE
- * SOLIDS MIXING
- * SOLIDS REACTION
- * DECANTING AND SOLIDS WASHING
- * REAGENT RECYCLING AND RECONDITIONING

PROCESS WASTEWATERS WOULD BE TEMPORARILY STORED IN ON-SITE TANKS UNTIL RECYCLED. WASTEWATER SLUDGES WOULD BE DEWATERED AND STOCKPILED. DEWATERED SLUDGES WOULD BE TRANSPORTED TO A RCRA - APPROVED FACILITY FOR TREATMENT AND LANDFILL DISPOSAL IN THE EVENT WASTE CHARACTERIZATION OF THE SLUDGE MATERIALS INDICATE THEY ARE A CHARACTERISTIC HAZARDOUS WASTE. FOR 22,400 CUBIC YARDS OF AFFECTED SOLIDS, A SOIL WASHING OPERATION OF 10 HOURS PER DAY, 5 DAYS PER WEEK WOULD REQUIRE 55 WEEKS OF OPERATION.

OPTION 7C: PHYSICAL STABILIZATION - SOLIDIFICATION/FIXATION

PHYSICAL STABILIZATION IS A REMEDIATION TECHNOLOGY FREQUENTLY USED FOR AFFECTED SOIL AND SLUDGE. NEW RCRA RESTRICTIONS BANNING LAND DISPOSAL OF HAZARDOUS WASTES RECOMMEND STABILIZATION, SOLIDIFICATION, AND/OR FIXATION FOR A MAJORITY OF THE CHARACTERISTIC HAZARDOUS WASTES. THIS TREATMENT WOULD TEND TO REDUCE THE MOBILITY OF WASTE CONSTITUENTS BY BINDING THE SOIL OR SLUDGE INTO A STABLE, OFTEN SOLID, MATRIX THAT WOULD

RESIST LEACHING. SOLIDIFICATION RESULTS IN THE FORMATION OF A LOW PERMEABILITY MONOLITH. THIS SOLID MONOLITH IS PREFERABLE TO STABILIZED, SOIL-LIKE WASTE WHEN ROUTINE ACCESS TO THE TREATED WASTE IS PREDICTED. A SOLIDIFICATION TREATMENT SYSTEM WOULD CONSIST OF THE FOLLOWING UNIT

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OPERATIONS:

- * MATERIAL PROCESSING/SORTING
- * SETTING AGENT STORAGE
- * PUGMILL MIXING

THE EFFECTIVENESS OF SOLIDIFICATION HAS BEEN DEMONSTRATED AT MANY CERCLA SITES FOR A WIDE VARIETY OF INORGANIC ANALYTES. VENDORS OF SOLIDIFICATION PROCESSES HAVE INDICATED THAT AVAILABLE ANALYTICAL DATA FROM THE GSST SITE INDICATE THAT POTENTIAL INTERFERENCES WITH TRADITIONAL STABILIZATION/SOLIDIFICATION AGENTS ARE NOT PRESENT IN SUFFICIENT QUANTITIES TO IMPACT TREATMENT PERFORMANCE LEACH TESTING OF TREATABILITY SAMPLES OF SLUDGE FROM THE GSST SITE WAS CONDUCTED TO DETERMINE THE FEASIBILITY OF PROVIDING A STABILIZED WASTE EXHIBITING ACCEPTABLE QUANTITIES AND CONCENTRATIONS OF LEACHATE UNDER TEST CONDITIONS. TCLP ANALYSES OF SOLIDIFIED SLUDGE INDICATE THAT SOLIDIFICATION WITH PORTLAND CEMENT IS SUFFICIENT OVER A RANGE OF MIX RATIOS TO PREVENT THE GENERATION OF LEACHATE EXCEEDING HAZARDOUS WASTE LIMITS. COMPRESSIVE STRENGTH TESTING SUGGESTS THAT THIS SOLIDIFIED MATERIAL WILL HAVE ACCEPTABLE GEOTECHNICAL CHARACTERISTICS.

THE EQUIPMENT REQUIRED FOR SOLIDIFICATION WOULD BE SIMILAR TO THAT USED FOR CEMENT MIXING. THE TREATED MATERIAL WOULD BE TRANSPORTED BACK TO THE EXCAVATION FOR DISPOSAL AND CURING. ASSUMING AN AVERAGE THROUGHPUT OF 25 CUBIC YARDS PER HOUR AND AN OPERATION OF 10 HOURS PER DAY, 5 DAYS PER WEEK, SOLIDIFICATION WOULD REQUIRE APPROXIMATELY 25 WEEKS OF OPERATION.

CHEMICAL-SPECIFIC ARARS ARE TRIGGERED BY THE ACTION-SPECIFIC ARARS FOR LAND DISPOSAL ONCE THE AFFECTED SOILS AND SLUDGE ARE EXCAVATED. THE PRIMARY PERFORMANCE STANDARDS FOR THE TECHNOLOGIES ANALYZED FOR THIS ALTERNATIVE ARE THOSE IMPOSED BY THE LDRS FOR WASTE CHARACTERISTICS EXHIBITED BY TCLP ANALYSIS OF THE EXCAVATED MATERIALS. HOWEVER, ANY STABILIZED/SOLIDIFIED SOILS AND SLUDGES WHICH ARE REPLACED ON-SITE MUST ALSO NOT RESULT IN EXCEEDANCES OF HEALTH BASED LEVELS FOR THOSE CONSTITUENTS ESTABLISHED AS REMEDIAL ACTION TARGET LEVELS (SEE TABLE 18). RESULTS OF TREATABILITY STUDIES WILL BE REVIEWED DURING REMEDIAL DESIGN TO ASSURE THE REMEDY IS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT. FOR THE CONSTITUENTS OF CONCERN, LDR CONCENTRATION-BASED STANDARDS FOR THE STABILIZED/SOLIDIFIED SOILS AND SLUDGE MUST BE MET PRIOR TO DISPOSAL. LOCATION-SPECIFIC ARARS FOR SOILS AND SLUDGE WILL BE ATTAINED. TCLP ANALYSES OF SLUDGE AND AFFECTED SOILS FROM THE GSST WASTE MANAGEMENT AREA INDICATE THAT CADMIUM MAY REQUIRE TREATMENT TO MEET THE LDR STANDARD OF 1.0 MG/L IN THE EXTRACT. STABILIZATION IS THE BDAT SPECIFIED FOR CADMIUM. ONCE THE LDR STANDARDS ARE MET, THERE ARE NO ARARS FOR BACKFILLING THE TREATED RESIDUALS OTHER THAN LOCAL

ORDINANCES FOR EROSION CONTROL. BACKFILLED AREAS WILL BE MANAGED TO COMPLY WITH THESE ORDINANCES. SURFACE WATER IN THE LAGOONS WILL BE COLLECTED AND DISCHARGED TO THE LOCAL SEWER AUTHORITY FOR TREATMENT AND WILL ATTAIN SURFACE WATER ARARS.

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EACH OF THE THREE POTENTIAL TREATMENT OPTIONS PRESENTED UNDER THIS ALTERNATIVE HAS BEEN SHOWN TO BE EFFECTIVE IN REDUCING AT LEAST ONE OF THE THREE WASTE CHARACTERISTICS: TOXICITY, MOBILITY, OR VOLUME, FOR ONE OR MORE OF THE SITE CONSTITUENTS OF CONCERN. THIS COMBINATION OF WASTE TREATMENT AND CAPPING THE BACKFILLED RESIDUALS WITH A SOIL AND VEGETATIVE COVER MEETS THE EPA'S CRITERIA OF PERMANENT REMEDIES THAT PROVIDE FOR PROTECTION OF HUMAN HEALTH AND 1 THE ENVIRONMENT. THE INCREMENTAL RISK AFTER IMPLEMENTATION OF ANY OF THESE TREATMENT OPTIONS WOULD BE 2 X (10-5) FOR CARCINOGENIC CONSTITUENTS AND 0.17 FOR THE HAZARD INDEX. BOTH ARE WITHIN ACCEPTED EPA GUIDELINES FOR RISK EXPOSURE.

BECAUSE THESE ALTERNATIVES WILL RESULT IN TREATED HAZARDOUS SUBSTANCES REMAINING ON-SITE, A REVIEW WILL BE CONDUCTED WITHIN FIVE YEARS AFTER COMMENCEMENT OF REMEDIAL ACTION AT THE SITE. THE FIVE-YEAR REVIEW WILL BE CONDUCTED TO ENSURE THAT THE ALTERNATIVES DESCRIBED UNDER THIS SECTION CONTINUE TO PROVIDE ADEQUATE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT AND TO EVALUATE IF FEDERAL AND STATE CLEANUP STANDARDS ARE STILL ADEQUATE AND PROTECTIVE.

ESTIMATED PRESENT-WORTH COSTS ARE AS FOLLOWS:

OPTION 7A: TOTAL CAPITAL COSTS	\$18,360,000
PRESENT WORTH, 30-YEAR O&M	\$991,500
TOTAL PRESENT WORTH	\$19,351,500
OPTION 7B: TOTAL CAPITAL COSTS	\$12,800,000
PRESENT WORTH, 30-YEAR O&M	\$991,500
TOTAL PRESENT WORTH	\$13,791,500
OPTION 7C: TOTAL CAPITAL COSTS	\$3,537,500
PRESENT WORTH, 30-YEAR O&M	\$991,500
TOTAL PRESENT WORTH	\$4,529,000

ALTERNATIVE 8 - IN SITU TREATMENT OF SOILS AND SLUDGES

ALTERNATIVE 8 CONSISTS OF TREATMENT OF AFFECTED SOILS AND SLUDGE IN PLACE, OR IN SITU. AFFECTED SOILS LOCATED OUTSIDE OF THE WASTE MANAGEMENT AREA (TRUCK TURNAROUND AREA AND DRAINAGE SWALE AREA) WOULD BE CONSOLIDATED TO LAGOON NO. 4 IN THE WASTE MANAGEMENT AREA PRIOR TO TREATMENT. FOLLOWING TREATMENT, INDIVIDUAL TREATMENT ZONES WILL BE COVERED WITH ONE FOOT OF CLEAN SOIL AND SOWN WITH SHALLOW-ROOTED GRASSES TO MINIMIZE EROSION. THREE PROCESS OPTIONS WERE SELECTED BASED ON COMMERCIAL AVAILABILITY AND/OR HISTORY OF PRIOR APPLICATION FOR INORGANIC WASTES:

OPTION 8A: THERMAL TREATMENT - IN SITU VITRIFICATION
OPTION 8B: PHYSICAL STABILIZATION - IN SITU SOLIDIFICATION
OPTION 8C: PHYSICAL STABILIZATION - IN SITU PRECIPITATION

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THE SURFACE SOIL REMEDIAL ACTION TARGET CONCENTRATIONS WOULD BE USED TO DETERMINE THE TREATMENT BOUNDARIES FOR SURFACE SOILS. TREATED SOLIDS WOULD REMAIN IN PLACE. A SIX-INCH LAYER OF CLEAN TOPSOIL, AND A SIX-INCH LAYER OF UNAFFECTED NATIVE SOILS WOULD BE PLACED ON TOP OF THE RESIDUALS. THE TOP SOIL WOULD BE SOWN WITH SHALLOW-ROOTED GRASSES TO MINIMIZE EROSION.

OPTION 8A: THERMAL TREATMENT - IN SITU VITRIFICATION

THE IN SITU VITRIFICATION SYSTEM WOULD CONSIST OF THE FOLLOWING UNIT OPERATIONS:

- * VITRIFICATION UNIT
- * HOOD FOR COLLECTING GASES AND FUMES
- * SCRUBBER WATER TREATMENT

THE IN SITU VITRIFICATION PROCESS HAS EXHIBITED A HIGHER RATE OF SUCCESS IN CAPTURING VOLATILE METALS THAN THE ABOVE-GROUND PROCESS. AS TEMPERATURES IN THE TREATMENT ZONES EXCEED THE MELTING TEMPERATURE OF THE SOIL, THE MOLTEN SOIL TENDS TO ENTRAIN MANY OF THE MORE VOLATILE METALS, SUCH AS LEAD AND CADMIUM.

MOBILIZATION AND STARTUP MAY REQUIRE IN EXCESS OF TWO YEARS DUE TO THE LACK OF COMMERCIALY AVAILABLE TREATMENT UNITS FOR VITRIFICATION. STARTUP TESTS REQUIRED PRIOR TO OPERATION MAY REQUIRE SEVERAL ADDITIONAL MONTHS. THROUGHPUT FOR VITRIFICATION IS SLIGHTLY LOWER FOR IN SITU MATERIALS THAN FOR EXCAVATED MATERIALS BECAUSE THE EQUIPMENT MUST BE RELOCATED AFTER EACH IN SITU VITRIFICATION CYCLE. ASSUMING AN OPERATION OF 10 HOURS PER DAY, 5 DAYS PER WEEK, IN SITU VITRIFICATION OF 22,400 CUBIC YARDS WOULD REQUIRE OVER 200 WEEKS OF OPERATION.

OPTION 8B: PHYSICAL SOLIDIFICATION - IN SITU SOLIDIFICATION

THIS OPTION INCLUDES THE USE OF DEEP SOIL MIXING EQUIPMENT THAT DELIVERS SOLIDIFICATION REAGENTS TO THE AFFECTED SOLIDS DURING MIXING OPERATIONS. THE PROCESS INVOLVES AUGERING INTO THE AFFECTED SOLIDS TO THE DESIRED DEPTH USING HOLLOW-STEM AUGERS. TREATMENT AGENTS ARE INJECTED INTO THE DISTURBED MATRIX THROUGH JETS CONSTRUCTED IN THE AUGER BLADES. THIS SYSTEM WOULD CONSIST OF THE FOLLOWING UNIT OPERATIONS:

- * DRILL ASSEMBLY
- * REAGENT CONTAINERS AND FEED SYSTEMS

DRILLING DEPTHS ARE LIMITED, BUT DEPTHS UP TO 30 FEET ARE REPORTEDLY ATTAINABLE. TREATMENT DURATION WILL VARY BY DEPTH AND BY THE AMOUNT OF

MIXING REQUIRED TO ENSURE ADEQUATE SOLIDIFICATION. TREATABILITY STUDIES WOULD BE NECESSARY DURING THE REMEDIAL DESIGN PHASE TO SELECT THE OPTIMAL REAGENT COMPOSITION AND FORM. TESTING OF THE SOLIDIFIED TREATMENT ZONES WOULD ALSO BE NECESSARY TO ENSURE THAT PERFORMANCE

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REQUIREMENTS ARE BEING MET.

OPTION 8C: PHYSICAL STABILIZATION - IN SITU PRECIPITATION

THIS OPTION INCLUDES THE ADDITION OF A PRECIPITATION AGENT TO THE AFFECTED SOLIDS TO BIND THE INORGANICS AND REDUCE MOBILITY. REAGENTS ARE ADDED TO THE SOILS IN SITU AND ALLOWED TO PERCOLATE WITHOUT PRESSURE. A PHYSICAL STABILIZATION SYSTEM WOULD CONSIST OF THE FOLLOWING UNIT OPERATIONS:

- * REAGENT MIX TANK
- * REAGENT DELIVERY SYSTEM

THE EXPECTED EFFICIENCY FOR THIS OPTION IS SITE-SPECIFIC. TREATABILITY STUDIES ARE NECESSARY FOR EVALUATION OF IN SITU PRECIPITATION PRIOR TO REMEDIAL ACTION. IN ADDITION TO EVALUATING THE PARAMETER-SPECIFIC EFFECTIVENESS OF THE TREATMENT PROCESS, THE TREATABILITY STUDY WOULD FOCUS ON SUCH PHYSICAL PROPERTIES AS SOIL PERMEABILITY AND GRAIN-SIZE DISTRIBUTION.

ACCORDING TO EPA GUIDANCE ON THE APPLICABILITY OF LDRS TO CERCLA RESPONSE ACTIONS, CONSOLIDATION OF THE SURFACE SOILS FOR TREATMENT WITH IN SITU WASTES WILL NOT REQUIRE A WAIVER FOR THE RCRA LAND DISPOSAL RESTRICTIONS. THE LDRS WILL BE MET BY TREATMENT OF THE CONSOLIDATED SURFACE SOILS IN THIS ALTERNATIVE. SURFACE WATER IN THE LAGOONS WILL BE COLLECTED AND DISCHARGED TO THE LOCAL SEWER AUTHORITY FOR TREATMENT AND WILL ATTAIN SURFACE WATER ARARS. A PORTION OF THE LAGOON WATER MAY BE USED AS AN INGREDIENT OF THE SOLIDIFICATION PROCESS.

THE MINIMUM LEVEL OVERALL PROTECTION PROVIDED BY IN SITU SOLIDIFICATION IS $1 \times (10^{-5})$ FOR THE LIFETIME EXCESS CANCER RISK AND 0.17 FOR THE HAZARD INDEX. THE ADDITIONAL PROTECTION OFFERED BY STABILIZATION/SOLIDIFICATION IS FURTHER ENHANCED BY THE SHORT-TERM PROTECTIVENESS GAINED FROM TREATMENT WITHOUT EXCAVATION OF WASTE MATERIALS. FURTHERMORE, THE RISK OF POTENTIAL RELEASES OFF-SITE DURING TRANSPORTATION TO, AND DISPOSAL AT, A TSD FACILITY WILL BE ELIMINATED BY THIS ALTERNATIVE.

BECAUSE THESE ALTERNATIVES RESULT IN TREATED HAZARDOUS MATERIALS REMAINING ON-SITE, A REVIEW WILL BE CONDUCTED WITHIN FIVE YEARS AFTER COMMENCEMENT OF REMEDIAL ACTION AT THE SITE. THIS REVIEW WILL BE CONDUCTED TO ENSURE THAT THE ALTERNATIVES DISCUSSED ABOVE REMAIN EFFECTIVE IN PROTECTING HUMAN HEALTH AND THE ENVIRONMENT.

ESTIMATED PRESENT-WORTH COSTS ARE AS FOLLOWS:

OPTION 8A: TOTAL CAPITAL COSTS = \$12,219,000
PRESENT WORTH, 30-YEAR O&M = \$991,500
TOTAL PRESENT WORTH = \$13,210,500

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OPTION 8B: TOTAL CAPITAL COSTS = \$3,089,107
PRESENT WORTH, 30-YEAR O&M = \$991,500
TOTAL PRESENT WORTH = \$4,080,607

OPTION 8C: TOTAL CAPITAL COSTS = \$3,314,807
PRESENT WORTH, 30-YEAR O&M = \$991,500
TOTAL PRESENT WORTH = \$4,306,307

SCREENING OF REMEDIAL ALTERNATIVES

PRIOR TO THE DETAILED ANALYSIS OF ALTERNATIVES IN PHASE III OF THE FS, THE EIGHT ALTERNATIVES PRESENTED IN THIS SECTION WERE SCREENED TO ELIMINATE ALTERNATIVES THAT WERE INAPPROPRIATE, NOT IMPLEMENTABLE, OR CLEARLY NOT COST-EFFECTIVE. THE FOLLOWING DISCUSSION PROVIDES THE RATIONALE FOR ELIMINATING ALTERNATIVES 6, 7A, 79, 8A, AND 8C PRIOR TO THE DETAILED AND COMPARATIVE ANALYSIS OF ALTERNATIVES IN PHASE III OF THE FS.

ALTERNATIVE 6, STABILIZATION AND ON-SITE DISPOSAL OF SOLIDS, WAS NOT RETAINED FOR FURTHER CONSIDERATION. THE ADMINISTRATIVE FEASIBILITY OF SITING A HAZARDOUS WASTE LANDFILL AT THE SITE IS VERY DOUBTFUL DUE TO COMMUNITY ACCEPTANCE AND VARIOUS TECHNICAL COMPLICATIONS. NEITHER THE VOLUME NOR TOXICITY OF AFFECTED SOLIDS WOULD BE REDUCED BY THE IMPLEMENTATION OF THIS ALTERNATIVE. MOBILITY WOULD BE REDUCED IN A PROPERLY-CONSTRUCTED LANDFILL, BUT LONG-TERM MAINTENANCE WOULD BE ESSENTIAL FOR PROTECTION OF THE ENVIRONMENT.

ALTERNATIVE 7, OPTION 7A, THERMAL TREATMENT (VITRIFICATION) AND ON-SITE DISPOSAL OF SOLIDS, WAS NOT RETAINED FOR FURTHER CONSIDERATION. THIS OPTION'S TECHNICAL FEASIBILITY HAS NOT BEEN WELL DEMONSTRATED FOR METAL-BEARING SOILS AND SLUDGES. THE PROCESS III DOES NOT APPEAR CAPABLE OF TREATING VOLATILE METALS, SUCH AS ARSENIC AND CADMIUM. THE LEVEL OF RISK REDUCTION ASSOCIATED WITH THIS OPTION CAN BE ACHIEVED BY OTHER REMEDIAL ALTERNATIVES IN A MORE COST-EFFECTIVE MANNER.

ALTERNATIVE 7, OPTION 7B, PHYSICAL SEPARATION (SOIL WASHING) AND ON-SITE DISPOSAL OF SOLIDS, WAS NOT RETAINED FOR FURTHER CONSIDERATION. THIS OPTION WOULD REDUCE WASTE CONSTITUENT CONCENTRATIONS IN SOLID MATERIALS. ITS TECHNICAL FEASIBILITY HAS BEEN DEMONSTRATED FOR MANY OF THE IDENTIFIED WASTE CONSTITUENTS. IT MAY PROVIDE AN EFFECTIVE MEANS OF REDUCING TOXICITY AND VOLUME. TREATABILITY TESTING WOULD BE REQUIRED. HOWEVER, WASHING SLUDGES QUANTITIES OF HAZARDOUS WASTEWATER THAT REQUIRE GENERATES LARGE FURTHER TREATMENT PRIOR TO DISPOSAL. "TREATING SLUDGES TO GENERATE SLUDGES" WAS NOT CONSIDERED PRACTICAL AND THEREFORE, NOT RETAINED FOR FURTHER CONSIDERATION.

ALTERNATIVE 8, OPTION 8A, IN SITU THERMAL TREATMENT (VITRIFICATION), WAS NOT RETAINED FOR FURTHER CONSIDERATION. THIS OPTION'S TECHNICAL FEASIBILITY HAS NOT BEEN DEMONSTRATED IN THE FIELD. THE LEVEL OF RISK REDUCTION ASSOCIATED WITH THIS OPTION CAN BE ACHIEVED BY OTHER REMEDIAL

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ALTERNATIVES IN A MORE COST-EFFECTIVE MANNER.

ALTERNATIVE 8, OPTION 8C, IN SITU PHYSICAL STABILIZATION (PRECIPITATION), WAS ELIMINATED FOR DETAILED EVALUATION. THE EFFECTIVENESS OF THIS ALTERNATIVE IS QUESTIONABLE AT THE GSST SITE BECAUSE OF THE UNCERTAINTY OF CONTACT BETWEEN WASTE CONSTITUENTS AND PRECIPITATION AGENTS. NOT ENOUGH IS KNOWN ABOUT THE LONG-TERM EFFECTIVENESS OF PRECIPITATION TO JUSTIFY ADDITIONAL CONSIDERATION.

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SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

DURING PHASE III OF THE FS, THE ALTERNATIVES RETAINED FOR FURTHER CONSIDERATION AND DESCRIBED IN SECTION 7.0 WERE ANALYZED IN DETAIL USING THE NINE EVALUATION CRITERIA. A COMPARATIVE ANALYSIS WAS CONDUCTED TO DETERMINE WHICH ALTERNATIVE PROVIDES THE BEST BALANCE OF TRADEOFFS WITH RESPECT TO THE FOLLOWING NINE CRITERIA:

THRESHOLD CRITERIA

- 1) OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT;
- 2) COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS);

PRIMARY BALANCING CRITERIA -

- 3) LONG-TERM EFFECTIVENESS AND PERMANENCE;
- 4) REDUCTION OF TOXICITY, MOBILITY, AND VOLUME;
- 5) SHORT-TERM EFFECTIVENESS;
- 6) IMPLEMENTABILITY;
- 7) COST;

MODIFYING CRITERIA -

- 8) STATE/SUPPORT AGENCY ACCEPTANCE, AND;
- 9) COMMUNITY ACCEPTANCE.

TABLE 16 PROVIDES A SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES FOR THE GOLDEN STRIP SEPTIC TANK SITE. THE INFORMATION PRESENTED IN

TABLE 16 IS PRESENTED TO PROVIDE A SITE-SPECIFIC COMPARISON BETWEEN ALTERNATIVES WITH RESPECT TO THE THRESHOLD AND PRIMARY BALANCING CRITERIA. TO THE EXTENT THAT DIFFERENTIATION IS POSSIBLE BETWEEN REMEDIAL MEASURES, THE ALTERNATIVES ARE RANKED ACCORDING TO THE RELATIVE

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DEGREE TO WHICH EACH SATISFIES THE CRITERIA. WHERE THE BENEFITS OF ONE ALTERNATIVE ARE SIMILAR TO THOSE OF ANOTHER, THE ALTERNATIVES ARE ASSIGNED THE SAME NUMERIC VALUE. THE NUMBERS LISTED IN THE LAST ROW ARE CUMULATIVE SCORES OF THE RANKINGS FOR EACH ALTERNATIVE. THESE NUMBERS ARE SUMMED TO SHOW THE DEGREE OF RELATIVE COMPLIANCE WITH THE SEVEN THRESHOLD AND PRIMARY BALANCING CRITERIA. THE RANKING SYSTEM IS DESIGNED SO THAT THE ALTERNATIVE WITH THE LOWEST SCORE PROVIDES THE GREATEST DEGREE OF COMPLIANCE WITH THE SEVEN CRITERIA. THE SUMMARY OF ALTERNATIVE COSTS IS PROVIDED IN TABLE 17.

DISCUSSION OF THE RELATIVE PERFORMANCE OF THE ALTERNATIVES WITH RESPECT TO THE NINE CRITERIA IS INCLUDED BELOW.

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

THIS CRITERION ADDRESSES WHETHER A REMEDY PROVIDES ADEQUATE PROTECTION AND DESCRIBES HOW RISKS POSED THROUGH EACH PATHWAY ARE ELIMINATED, REDUCED, OR CONTROLLED THROUGH TREATMENT, ENGINEERING CONTROLS, OR INSTITUTIONAL CONTROLS. EPA HAS ESTABLISHED A LIMIT OF $1 \times (10^{-4})$ TO $1 \times (10^{-6})$ AS ACCEPTABLE LIMITS FOR EXCESS LIFETIME CARCINOGENIC RISKS. EPA HAS ALSO ESTABLISHED THAT A HAZARD INDEX RATING EXCEEDING 1.0 FOR NON-CARCINOGENIC CONSTITUENTS SUGGESTS POTENTIAL CONCERN FOR TOXIC EFFECTS IN SENSITIVE PORTIONS OF THE EXPOSED POPULATION.

ALL ALTERNATIVES, EXCEPT ALTERNATIVE 1 (NO ACTION), BRING THE EXPOSURE LEVELS FOR CARCINOGENIC AND NON-CARCINOGENIC CONSTITUENTS, WITHIN ACCEPTABLE RISK RANGES FOR HUMAN HEALTH. ALTERNATIVE 7C, SOLIDIFICATION/FIXATION AND ON-SITE DISPOSAL OF SOILS AND SLUDGES, AND ALTERNATIVE 8B, IN SITU SOLIDIFICATION PROVIDE THE GREATEST DEGREE OF PROTECTIVENESS OF HUMAN HEALTH AND THE ENVIRONMENT. THE AFFECTED MATERIALS WOULD BE SOLIDIFIED TO IMMOBILIZE THE WASTE CONSTITUENTS, MAKING THE CONSTITUENTS UNAVAILABLE FOR MIGRATION THROUGH ANY PATHWAY. THE PROTECTIVENESS IS ALSO INCREASED BY THE "CAPPING EFFECT" PROVIDED BY THE SOLIDIFIED MATERIALS OVER THE LESS AFFECTED SUBSOILS CONTAINING WASTE CONSTITUENTS. IMPLEMENTATION OF THESE ALTERNATIVES WOULD RESULT IN AN UPPER BOUND EXCESS CANCER RISK OF $2 \times (10^{-5})$ AND A HAZARD INDEX OF 0.17 FOR NON-CARCINOGENIC EFFECTS.

ALTERNATIVE 4, STABILIZATION AND OFF-SITE DISPOSAL OF SOILS AND SLUDGES, PROVIDES PERMANENT REMOVAL OF THE AFFECTED MATERIALS REQUIRING REMEDIAL ACTION, BUT THE SHORT-TERM RISK IS INCREASED DUE TO THE VOLUME OF TRUCK TRAFFIC NECESSARY TO TRANSPORT THE MATERIALS OFF-SITE. ALTERNATIVES 2, 3 AND 5 ALL PROVIDE THE SAME DEGREE OF PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT. CONTAINMENT ALTERNATIVES PROVIDE SOME PROTECTION TO THE ENVIRONMENT BY MINIMIZING MIGRATION OF WASTE CONSTITUENTS DUE TO EROSION PATHWAYS AND INFILTRATION OF PRECIPITATION. HOWEVER, THIS

PROTECTIVENESS IS LESS THAN THAT PROVIDED BY THE TREATMENT ALTERNATIVES 7 AND 8.

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENT

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(ARARS)

THIS CRITERION ADDRESSES WHETHER ALTERNATIVES WILL MEET ALL OF THE ARARS OF OTHER FEDERAL AND STATE ENVIRONMENTAL LAWS AND/OR JUSTIFIES A WAIVER.

ALTERNATIVES 3 THROUGH 8 WILL COMPLY WITH ALL CHEMICAL-SPECIFIC, LOCATION-SPECIFIC, AND ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS THROUGH THE RESPECTIVE REMEDIAL ACTIONS. ALTERNATIVE 1, NO ACTION, AND ALTERNATIVE 2, INSTITUTIONAL CONTROLS DO NOT COMPLY WITH SURFACE WATER ARARS SINCE COLLECTION AND DISCHARGE OF IMPOUNDED SURFACE WATER IN LAGOON NOS. 1 AND 4 IS NOT INCLUDED AS PART OF THESE ALTERNATIVES.

LONG-TERM EFFECTIVENESS AND PERMANENCE

THIS EVALUATION CRITERION REFERS TO EXPECTED RESIDUAL RISK AND THE ABILITY OF THE ALTERNATIVE TO MAINTAIN RELIABLE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT OVER TIME, ONCE CLEAN-UP GOALS HAVE BEEN MET.

ALTERNATIVES 4, 7 AND 8 PROVIDE THE GREATEST DEGREE OF LONG-TERM EFFECTIVENESS AND PERMANENCE. ALTERNATIVES 7 AND 8 WILL EFFECTIVELY IMMOBILIZE WASTE CONSTITUENT SOURCE AREAS, PROVIDING LONG-TERM EFFECTIVENESS. ALTERNATIVE 4 WILL REMOVE AND TREAT AFFECTED SOILS AND SLUDGES THAT EXCEED REMEDIAL ACTION TARGET LEVELS AND DISPOSE OF THE TREATED RESIDUALS IN AN APPROVED RCRA LANDFILL. THESE THREE ALTERNATIVES PROVIDE A GREATER DEGREE OF PERMANENCE THAN THE OTHER ALTERNATIVES CONSIDERED IN THIS COMPARATIVE ANALYSIS.

ALTERNATIVES 2, 3 AND 5 PROVIDE A LESSER DEGREE OF LONG-TERM EFFECTIVENESS AND PERMANENCE. ALTERNATIVE 5, STABILIZATION AND OFF-SITE DISPOSAL OF SLUDGE AND CONTAINMENT OF AFFECTED SOILS, WILL ELIMINATE CONSTITUENT SOURCE AREAS, AND WILL CONTROL DIRECT CONTACT PATHWAYS WITH RESIDUALS THROUGH CAPPING OF AFFECTED SOILS.

ALTERNATIVE 3 WILL PROVIDE GREATER LONG-TERM EFFECTIVENESS THAN ALTERNATIVE 2 BY ELIMINATING THE RISK OF DIRECT CONTACT. HOWEVER, ALTERNATIVES 2 AND 3 RESULT IN THE MOST-CONCENTRATED SOURCE OF WASTE CONSTITUENTS REMAINING ON-SITE WITH NO TREATMENT.

REDUCTION OF TOXICITY, MOBILITY, OR VOLUME

THIS CRITERION TAKES INTO ACCOUNT THE ANTICIPATED PERFORMANCE OF THE TREATMENT TECHNOLOGY A REMEDIAL ALTERNATIVE MAY EMPLOY.

ALTERNATIVES 4, 7 AND 8 PROVIDE THE GREATEST DEGREE OF REDUCTION IN TOXICITY, MOBILITY, OR VOLUME. ALTERNATIVE 4 WILL REDUCE THE MOBILITY

OF BOTH THE EXCAVATED MATERIALS AND THE REMAINING SOILS. THE SOLIDIFICATION PROCESS OF ALTERNATIVES 7 AND 8 WILL ADEQUATELY TREAT THE COCS, RESULTING IN A GREAT REDUCTION OF MOBILITY AND TOXICITY OF WASTE CONSTITUENTS. ALTERNATIVES 7 AND 8 GREATLY REDUCE THE EXPOSURE

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POTENTIAL OF WASTE CONSTITUENTS DUE TO SOIL AND SLUDGE TREATMENT, BACKFILLING WITH TREATED SOILS, COVERING WITH CLEAN SOILS, ESTABLISHING A VEGETATIVE COVER AND LONG-TERM MONITORING. SOLIDIFICATION IS ESTIMATED TO INCREASE THE TOTAL VOLUME BY 5 TO 50 PERCENT, DEPENDING ON THE TYPE AND QUANTITY OF ADDITIVES USED.

ALTERNATIVE 5 WILL REDUCE THE MOBILITY OF THE EXCAVATED SLUDGE MATERIAL BY STABILIZATION AND THE REMAINING AFFECTED SOILS BY CAPPING. ALTERNATIVE 3 ALSO CONSISTS OF CAPPING THE ENTIRE WASTE MANAGEMENT AREA. CAPPING WILL MINIMIZE INFILTRATION OF PRECIPITATION AND PREVENT EROSION. TOXICITY AND VOLUME MAY BE SLIGHTLY REDUCED OVER TIME TO THE EXTENT THAT NATURAL DEGRADATION OF ORGANIC CONSTITUENTS OCCURS. INSTITUTIONAL CONTROLS ASSOCIATED WITH ALTERNATIVE 2 REDUCES THE WASTE CHARACTERISTICS TO THE SAME DEGREE AS NO ACTION.

SHORT-TERM EFFECTIVENESS

ALTERNATIVE 1, NO ACTION, PRESENTS NO EFFECT ON THE ENVIRONMENT IN THE SHORT-TERM AND, THEREFORE, PROVIDES THE GREATEST DEGREE OF SHORT-TERM EFFECTIVENESS. ALTERNATIVE 2 WILL PROVIDE A DEGREE OF SHORT-TERM EFFECTIVENESS APPROXIMATELY EQUAL TO ALTERNATIVE 1.

APPROXIMATELY 28,600 CUBIC YARDS OF MATERIALS CONTAINING COCS AT CONCENTRATIONS EXCEEDING REMEDIAL ACTION LEVELS WILL BE EXCAVATED AND TREATED UNDER ALTERNATIVE 7. SITE DISTURBANCES DUE TO EXCAVATION AND MATERIAL HANDLING ARE EXTENSIVE, BUT MANAGEABLE. DUST EMISSIONS DURING EXCAVATION AND TREATMENT CAN BE EFFECTIVELY CONTROLLED WITH STANDARD ENGINEERING CONTROLS SUCH AS INCREASING THE MOISTURE CONTENT OF THE MATERIALS. ALTERNATIVE 8 PROVIDES APPROXIMATELY THE SAME DEGREE OF SHORT-TERM EFFECTIVENESS OF ALTERNATIVE 7, HOWEVER, FIELDWORK MAY TAKE LONGER TO COMPLETE THAN ALTERNATIVE 7.

SITE DISTURBANCES FOR ALTERNATIVES 3, 4 AND 5 ARE EXTENSIVE DUE TO THE VOLUME OF TRUCK TRAFFIC. ALTERNATIVE 3 REQUIRES EXTENSIVE TRUCK USAGE DUE TO THE VOLUME OF CLAY REQUIRED TO CONSTRUCT THE PROTECTIVE CLAY CAP. SOURCE REMOVAL AND OFF-SITE DISPOSAL OF WASTE MATERIAL UNDER ALTERNATIVE 4 WOULD REQUIRE APPROXIMATELY 800-1000 TRUCKLOADS OF STABILIZED WASTE AT 20 TONS PER TRUCKLOAD. ALTERNATIVE 5 WOULD POSE SIMILAR TRUCK TRAFFIC MANAGEMENT PROBLEMS. THE VOLUME OF TRUCK TRAFFIC REQUIRED FOR THESE THREE ALTERNATIVES SIGNIFICANTLY REDUCES THE SHORT-TERM EFFECTIVENESS.

IMPLEMENTABILITY

THIS CRITERION REFERS TO THE TECHNICAL AND ADMINISTRATIVE FEASIBILITY OF AN ALTERNATIVE, INCLUDING THE AVAILABILITY OF MATERIALS AND SERVICES NEEDED TO IMPLEMENT A PARTICULAR OPTION.

ALTERNATIVES 1 AND 2 ARE EASILY IMPLEMENTED USING EXISTING TECHNOLOGY. CONTAINMENT OF WASTE CONSTITUENTS UNDER ALTERNATIVE 3 ALSO UTILIZES EXISTING TECHNOLOGIES AND DOES NOT REQUIRE THE USAGE OF A TREATMENT,

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STORAGE, AND DISPOSAL FACILITY.

THE STABILIZATION AND SOLIDIFICATION PROCESSES PROPOSED FOR ALTERNATIVES 4 THROUGH 8 HAVE BEEN ROUTINELY APPLIED WITH SUCCESSFUL RESULTS TO SOILS THAT ARE TYPICAL IN THE PIEDMONT REGION OF SOUTH CAROLINA. HOWEVER, THE IN-SITU SOLIDIFICATION (ALTERNATIVE 8) PROCESS HAS NOT BEEN WELL DEMONSTRATED FOR TYPICAL SITE SOILS OR FOR THE LARGE AREAS REQUIRING TREATMENT AT THE SITE. THE MATERIALS HANDLING ISSUES MAY BE SIGNIFICANT AT THE GSST SITE FOR ALTERNATIVES REQUIRING DEWATERING OF THE SLUDGE. DEWATERING MAY BE COST-EFFECTIVE FOR STABILIZATION OF THE SLUDGE PRIOR TO TRANSPORT AND DISPOSAL (ALTERNATIVES 4 AND 5), SINCE DEWATERING LOWERS THE BULK DENSITY OF THE STABILIZED MATERIALS. THE SOLIDIFICATION PROCESSES OF ALTERNATIVES 7 AND 8 MAY ALSO REQUIRE DEWATERING OF THE SLUDGE TO MEET TREATMENT STANDARDS. THE STABILIZATION AND SOLIDIFICATION TREATMENT PROCESSES PROPOSED FOR THE GSST SITE SHOULD PROVE TO BE RELIABLE, BASED ON AVAILABLE INFORMATION, ALTHOUGH THE IN-SITU PROCESS IS MORE LIKELY TO EXPERIENCE OPERATIONAL DIFFICULTIES.

COST

THIS CRITERION ESTIMATES THE TOTAL COST REQUIRED TO IMPLEMENT AN ALTERNATIVE AND INCLUDES THE ESTIMATED CAPITAL, OPERATION AND MAINTENANCE (O&M) COSTS, AND PRESENT-WORTH COSTS. TABLE 17 PROVIDES A COMPARISON OF COSTS FOR ALL ALTERNATIVES DISCUSSED IN THIS SECTION.

ALTERNATIVES 1 AND 2 PROVIDE REMEDIES THAT ARE IN THE LOW RANGE, BUT OFFER NO TREATMENT OF THE SOURCE MATERIAL. THE TREATMENT ALTERNATIVES (ALTERNATIVES 7 AND 8) PROVIDE REMEDIES WITH A HIGH DEGREE OF PERMANENCE AT COSTS THAT ARE MID-RANGE FOR THE ALTERNATIVES EVALUATED IN PHASE III OF THE FS. CONTAINMENT ALTERNATIVES ACHIEVE THE SAME LEVEL OF RISK REDUCTION FOR APPROXIMATELY 40 PERCENT LESS COST, BUT WITH A LESSER DEGREE OF PERMANENCE. THE SOURCE REMOVAL ALTERNATIVES (ALTERNATIVES 4 AND 5) ALSO ACHIEVE SUBSTANTIAL RISK REDUCTION IN TERMS OF FUTURE EXPOSURE TO WASTE CONSTITUENTS, BUT THE SHORT-TERM RISKS ARE GREATER THAN FOR THE OTHER ALTERNATIVES, AND THE COSTS ARE SIGNIFICANTLY HIGHER.

STATE/SUPPORT AGENCY ACCEPTANCE

THE SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL (SCDHEC) HAS BEEN ACTIVELY INVOLVED IN THE RI/FS AND THE REMEDY SELECTION PROCESS AT THE GOLDEN STRIP SEPTIC TANK SITE. SCDHEC PROVIDED VALUABLE INPUT DURING THE FINALIZATION OF THE RI/FS DOCUMENT AND THE PROPOSED PLAN. SCDHEC HAS REVIEWED THIS RECORD OF DECISION AND CONCURS WITH ALL ASPECTS OF EPA'S SELECTED REMEDY EXCEPT THE METHODOLOGY UTILIZED TO DETERMINE THE REMEDIAL ACTION TARGET LEVEL FOR ARSENIC. SCDHEC'S CONCURRENCE LETTER ON THE SELECTED REMEDY FOR THE GSST SITE IS

INCLUDED AS AN ATTACHMENT TO THIS RECORD OF DECISION DOCUMENT.

COMMUNITY ACCEPTANCE

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EPA SOLICITED INPUT FROM THE COMMUNITY ON THE PROPOSED PLAN FOR CLEAN-UP OF THE GSST SITE. ALTHOUGH PUBLIC COMMENTS INDICATED NO SPECIFIC OPPOSITION TO THE PREFERRED ALTERNATIVE, SOME LOCAL RESIDENTS DID EXPRESS CONCERN OVER THE ACTUAL DEGREE OF PERMANENCE OF THE SELECTED REMEDY AND DEPRESSED PROPERTY VALUES IN THE NEIGHBORING AREA. THESE ISSUES ARE ADDRESSED INDIVIDUALLY IN THE ATTACHED RESPONSIVENESS SUMMARY.

#SR THE SELECTED REMEDY

EPA HAS SELECTED ALTERNATIVE 7C, SOLIDIFICATION/FIXATION AS THE REMEDY TO ADDRESS THE CONTAMINATED SURFACE SOIL AND LAGOON SLUDGE AT THE GOLDEN STRIP SEPTIC TANK SITE. THE REMEDY FOR THE CLEANUP OF THE GOLDEN STRIP SEPTIC TANK SITE CONSISTS OF THE FOLLOWING COMPONENTS:

CONTAMINATED SURFACE SOILS/LAGOON SLUDGES

CONSTITUENTS OF CONCERN AT THE SITE WERE IDENTIFIED AS PART OF THE REMEDIAL INVESTIGATION AND ARE LISTED IN SECTION 5.5 OF THIS ROD. THE BASELINE RISK ASSESSMENT, WHICH IS SUMMARIZED IN SECTION 6.0 OF THIS DOCUMENT, DEVELOPED REMEDIAL ACTION TARGET CONCENTRATIONS FOR THE IDENTIFIED COCS IN THE SOIL AND LAGOON SLUDGE. SINCE NO FEDERAL STANDARDS EXIST FOR TOXICANTS IN SOIL, HEALTH RISK-BASED CALCULATIONS (UNDER THE FUTURE LAND USE SCENARIO #2 WHICH ASSUMES A RESIDENCE AT THE SITE) WERE USED TO DERIVE CLEANUP LEVELS FOR MOST CONTAMINANTS IN SOIL AND SLUDGE AT THE SITE. CLEANUP LEVELS FOR LEAD ARE BASED ON OTHER EPA GUIDANCE FOR SUPERFUND SITES. TABLE 18 DISPLAYS THESE REMEDIAL ACTION TARGET CONCENTRATIONS FOR CONTAMINATED SOIL AND SLUDGE AT THE SITE.

FOR NONCARCINOGENS, A TARGET HAZARD QUOTIENT OF 0.3 WAS USED TO ALLOW FOR EXPOSURE TO MULTIPLE CONTAMINANTS WHOSE EFFECTS MAY BE ADDITIVE. A TARGET CARCINOGENIC RISK OF 1×10^{-6} WAS USED FOR ALL CARCINOGENS EXCEPT ARSENIC. A TARGET RISK OF 1×10^{-5} (STILL WELL WITHIN EPA'S TARGETED RISK RANGE) WAS USED FOR ARSENIC FOR THE FOLLOWING REASONS:

- * EPA BELIEVES THAT THE RELATIONSHIP BETWEEN THE HIGH DOSES FROM WHICH THE SLOPE FACTOR IS DERIVED AND THE LOW DOSES THAT WOULD OCCUR AS A RESULT OF SITE-RELATED EXPOSURES MAY NOT BE AS LINEAR AS IS ASSUMED IN A RISK CALCULATION;
- * THERE IS SOME EVIDENCE SUGGESTING THAT ARSENIC MAY BE AN ESSENTIAL ELEMENT FOR HUMANS; AND
- * ARSENIC IS NATURALLY OCCURRING IN THE ENVIRONMENT.

A TARGET RISK OF 1×10^{-5} FOR ARSENIC TRANSLATES INTO A CLEANUP CONCENTRATION OF 18 PPM. THE STATE OF SOUTH CAROLINA FEELS THAT A RISK LEVEL OF 1×10^{-6} SHOULD BE USED TO ESTABLISH CLEANUP LEVELS FOR

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ARSENIC AT THE SITE. SINCE THE ARSENIC CLEANUP LEVEL CALCULATED FOR A RISK OF 1×10^{-6} WOULD BE BELOW THE BACKGROUND RANGE FOR SURFACE SOILS AT THE SITE, THE STATE FEELS THE BACKGROUND RANGE, 0-3.5 PPM, SHOULD BE THE CLEANUP LEVEL FOR ARSENIC AT THE SITE. EPA FEELS THAT A CLEANUP LEVEL OF 18 PPM BASED ON A 1×10^{-5} RISK CALCULATION IS ADEQUATELY PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT BASED ON THE REASONS NOTED ABOVE. THIS CLEANUP LEVEL OF 18 PPM FOR ARSENIC AT THE SITE IS STILL WITHIN EPA'S TARGETED RISK RANGE OF 1×10^{-4} TO 1×10^{-6} .

THE OBJECTIVE OF THIS REMEDY WILL BE TO REDUCE THE MOBILITY OF WASTE-CONTAINING MATERIALS, WHILE MINIMIZING THE POTENTIAL FOR HUMAN HEALTH AND OFF-SITE ENVIRONMENTAL EXPOSURE TO HAZARDOUS SUBSTANCES BY A COMBINATION OF THE FOLLOWING FACTORS:

- * TREATMENT BY SOLIDIFICATION OF SOIL AND SLUDGE THAT EXCEED THE REMEDIAL ACTION TARGET CONCENTRATIONS LISTED IN TABLE 18;
- * BACKFILLING THE TREATED RESIDUALS IN THE ON-SITE EXCAVATIONS THAT WILL RESULT IN A SOLID, LOW PERMEABILITY MONOLITH THAT RESISTS LEACHING;
- * COVERING THE ON-SITE EXCAVATIONS WITH CLEAN SOIL;
- * ESTABLISHING A VEGETATIVE COVER THAT WILL PREVENT EROSION;
AND
- * LONG-TERM MONITORING TO ENSURE THE SOLIDIFIED MONOLITH REMAINS EFFECTIVE IN PROVIDING ADEQUATE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT.

THE FIRST STEP IN IMPLEMENTING THIS REMEDY IS MATERIALS EXCAVATION AND PREPROCESSING. APPROXIMATELY 22,400 CUBIC YARDS OF SOIL AND 4,200 CUBIC YARDS OF SLUDGE EXCEED THE REMEDIAL ACTION TARGET CONCENTRATIONS LISTED IN TABLE 18. INVESTIGATION OF THE ABANDONED DRUM AREA ON THE EASTERN SIDE OF THE RICE FARM HAS INDICATED THE PRESENCE OF CADMIUM AND CHROMIUM AT CONCENTRATIONS ABOVE REMEDIAL ACTION TARGET LEVELS. THE EXTENT OF THIS CONTAMINATION SHALL BE FURTHER INVESTIGATED DURING THE RD/RA PHASE OF THE PROJECT. LIMITED REMEDIATION OF THIS AREA IS ANTICIPATED, HOWEVER, THE VOLUME OF MATERIAL EXCEEDING TARGET LEVELS IS NOT EXPECTED TO SIGNIFICANTLY INCREASE THE VOLUMES NOTED ABOVE. FIGURE 12 ILLUSTRATES THE CONCEPTUAL LAYOUT OF THE REMEDY.

A SAMPLING PROGRAM SHALL BE DEVELOPED AND CONDUCTED PRIOR TO EXCAVATION TO DETERMINE THE ACTUAL VOLUMES OF SURFACE SOILS, OVERBURDEN, AND SLUDGE REQUIRING REMEDIAL ACTION. CONFIRMATION SAMPLING SHALL ALSO BE

CONDUCTED FOLLOWING EXCAVATION AND PRIOR TO BACKFILLING TREATED MATERIALS TO ENSURE THE UNDERLYING SOILS HAVE BEEN EXCAVATED TO THE APPROPRIATE CONCENTRATIONS LISTED IN TABLE 18.

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PLACEMENT OF HAZARDOUS WASTE AS DEFINED BY THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) LAND DISPOSAL RESTRICTIONS (LDRS) IS NOT APPLICABLE TO THIS CERCLA RESPONSE ACTION. THE AREA OF CONTAMINATION (AOC) AT THE SITE SHALL BE DELINEATED BY THE AREAL EXTENT, OR BOUNDARY, OF CONTIGUOUS CONTAMINATION. THE AOC SHALL CONSIST OF APPROXIMATELY 10 ACRES THAT INCLUDES THE FIVE WASTE LAGOONS, TRUCK TURNAROUND AREA AND THE DRAINAGE SWALE AREA. ACCORDING TO RCRA, PLACEMENT DOES NOT OCCUR WHEN WASTES ARE MOVED WITHIN A SINGLE AOC. ALL EXCAVATED WASTES AS PART OF THE SELECTED REMEDY IN THIS ROD SHALL BE CONSOLIDATED, PRE-PROCESSED AND TREATED WITHIN THE ESTABLISHED AREA OF CONTAMINATION.

ADDITIONAL WASTE CHARACTERIZATION OF LAGOON WASTE WAS CONDUCTED AS PART OF THE REMEDIAL INVESTIGATION. TCLP ANALYSIS RESULTS OF LAGOON SLUDGES AND AFFECTED SOILS INDICATE WASTE MATERIAL AT THE SITE EXHIBITS HAZARDOUS CHARACTERISTICS FOR CADMIUM. DUE TO THE PRESENCE OF CHARACTERISTIC RCRA WASTE AT THE SITE, LDRS ARE APPLICABLE TO THIS RESPONSE ACTION. TREATMENT BY SOLIDIFICATION SHALL RENDER THE WASTE PRESENT AT THE SITE AS "UNCHARACTERISTIC" FOR THE APPLICABLE FEDERAL REGULATORY STANDARDS. ESTABLISHED TCLP REGULATORY LIMITS FOR THE COCS PRESENT AT THE SITE ARE DELINEATED IN TABLE 19. TREATMENT OF WASTE MATERIAL AT THE SITE SHALL MEET THESE PROMULGATED FEDERAL STANDARDS. FURTHERMORE, THE SOLIDIFIED MONOLITH MUST DEMONSTRATE THE APPLICABLE GEOTECHNICAL STANDARD FOR ULTIMATE COMPRESSIVE STRENGTH OF 50 PSI.

ADDITIONALLY, FURTHER ASSURANCES SHALL BE CONDUCTED TO ENSURE THE TREATED MONOLITH LEACHES AT A CONCENTRATION THAT IS PROTECTIVE OF GROUND WATER AT THE SITE. THIS REQUIREMENT IS CONSIDERED TO BE A RELEVANT AND APPROPRIATE REQUIREMENT OF TREATMENT BY SOLIDIFICATION. DISPERSION MODELLING SHALL BE CONDUCTED TO ENSURE THE TREATED MONOLITH WILL NOT IMPACT THE GROUND WATER IN AN ADVERSE WAY. IF THE REGULATORY TCLP LIMITS DISPLAYED IN TABLE 19 ARE PROVEN INEFFECTIVE IN PROVIDING ADEQUATE PROTECTION OF GROUND WATER AT THE SITE, MORE STRINGENT LEVELS SHALL BE ESTABLISHED THAT WILL BE PROTECTIVE OF THE GROUND WATER.

THE EFFECTIVENESS OF SOLIDIFICATION HAS BEEN DEMONSTRATED AT MANY CERCLA SITES FOR A WIDE VARIETY OF INORGANIC AND LOW LEVEL ORGANIC ANALYTES. TREATMENT OF HEAVY METALS BY SOLIDIFICATION IS THE BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT). LEACH TESTING OF TREATABILITY SAMPLES OF SLUDGE FROM THE SITE WAS CONDUCTED TO DETERMINE THE EFFECTIVENESS OF SOLIDIFICATION IN PROVIDING A TREATED MONOLITH THAT WOULD EXHIBIT ACCEPTABLE QUANTITIES AND CONCENTRATIONS OF LEACHATE UNDER TEST CONDITIONS. TCLP ANALYSES OF SOLIDIFIED SLUDGE INDICATE THAT SOLIDIFICATION WITH PORTLAND CEMENT IS SUFFICIENT OVER A RANGE OF MIX RATIOS TO PREVENT THE GENERATION OF LEACHATE EXCEEDING HAZARDOUS WASTE LIMITS. COMPRESSIVE STRENGTH TESTING SUGGESTS THAT THIS SOLIDIFIED MATERIAL WILL HAVE ACCEPTABLE GEOTECHNICAL CHARACTERISTICS.

FURTHER TREATABILITY AND LEACH TESTING WILL BE NECESSARY TO DETERMINE THE APPROPRIATE COMBINATION OF SOLIDIFICATION AGENTS AND ADDITIVES TO PROVIDE A STABILIZED WASTE EXHIBITING ACCEPTABLE QUANTITIES AND

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CONCENTRATIONS OF LEACHATE UNDER TEST CONDITIONS. FIELD TRIALS WILL BE REQUIRED TO CONFIRM TREATMENT EFFECTIVENESS AND TO DETERMINE THE PHYSICAL AND CHEMICAL CHARACTERISTICS OF THE TREATED RESIDUALS.

FOLLOWING TREATMENT, THE TREATED RESIDUALS SHALL BE DISPOSED OF BY BACKFILLING THE ON-SITE EXCAVATIONS. A ONE-FOOT LAYER OF UNAFFECTED NATIVE SOIL, AND A SIX-INCH LAYER OF TOPSOIL SHALL BE PLACED ON TOP OF THE TREATED RESIDUALS. THE TOPSOIL SHALL THEN BE SOWN WITH SHALLOW-ROOTED GRASSES TO MINIMIZE EROSION.

BECAUSE THIS REMEDY WILL RESULT IN A TREATED MONOLITH OF HAZARDOUS SUBSTANCES REMAINING ON-SITE, A REVIEW SHALL BE CONDUCTED NO LESS OFTEN THAN EVERY FIVE YEARS AFTER COMMENCEMENT OF REMEDIAL ACTION AT THE SITE. THE FIVE-YEAR REVIEW SHALL BE CONDUCTED TO ENSURE THAT THE SELECTED REMEDY CONTINUES TO PROVIDE ADEQUATE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT AND TO EVALUATE IF FEDERAL AND STATE CLEANUP STANDARDS ARE STILL ADEQUATE AND PROTECTIVE.

GROUND WATER

THREE ROUNDS OF GROUND WATER SAMPLING AND ANALYSIS WERE CONDUCTED AS PART OF THE RI AND SUPPLEMENTAL RI FIELD ACTIVITIES. THE GROUND WATER RESULTS FROM THESE EVENTS INDICATED THAT LIMITED MIGRATION OF WASTE CONSTITUENTS HAS OCCURRED. RESULTS FROM THE RI SAMPLING INDICATED FOUR CONTAMINANTS IN GROUND WATER THAT EXCEEDED MAXIMUM CONTAMINANT LEVELS (MCLS). THESE CONTAMINANTS WERE CHROMIUM, LEAD, 1,2-DICHLOROPROPANE, AND 1,2-DICHLOROETHANE. SUBSEQUENT SAMPLING, WHICH TOOK PLACE AS PART OF THE SUPPLEMENTAL RI, REVEALED THAT MOST DETECTIONS WERE NOT REPRODUCIBLE IN INDIVIDUAL WELLS, AND FEW DETECTIONS EXCEEDED MCLS. NO CONTAMINANTS WERE DETECTED ABOVE BACKGROUND CONCENTRATIONS IN THE NEARBY STREAM.

THE ESTABLISHMENT OF ALTERNATE CONCENTRATION LIMITS (ACLS) FOR GROUND WATER AT THE SITE, AS DESCRIBED IN SECTION 121 OF CERCLA, IS INCLUDED AS PART OF THIS RESPONSE ACTION. THE APPLICABILITY OF ACLS AT THE GOLDEN STRIP SEPTIC TANK SITE IS DISCUSSED IN DETAIL IN SECTION 4.2 OF THIS DOCUMENT. EPA BELIEVES THAT ACTIVE AQUIFER REMEDIATION OF GROUND WATER AT THE SITE IS NOT REASONABLE OR TECHNICALLY PRACTICABLE. THE LOW AND SPORADIC DETECTIONS IN THE AQUIFER, AND THE ABSENCE OF CONTAMINANTS IN THE STREAM LED TO THE DECISION TO DEVELOP ACLS FOR THE GROUND WATER MONITORING, RATHER THAN INITIATE AQUIFER REMEDIATION.

THE ACLS WILL BE BASED ON TWO CRITERIA; 1) THAT GROUND WATER CONTAMINATION DOES NOT INCREASE, AND 2) THE CREEK NEAR THE SITE IS NOT ADVERSELY IMPACTED. GROUND WATER SAMPLES FROM MONITORING WELLS WILL BE COLLECTED AND ANALYZED TO DETERMINE IF CONTAMINATION IS INCREASING AND

STREAM SAMPLES WILL BE COLLECTED TO DETERMINE IF CONTAMINANT LEVELS INCREASE ABOVE BACKGROUND LEVELS IN THE CREEK.

THE NATIONAL CONTINGENCY PLAN (PAGE 8732) STATES THAT;

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"ACLS UNDER CERCLA GENERALLY CONSIDERS THE FACTORS SPECIFIED FOR ESTABLISHING ACLS UNDER RCRA WITH SEVERAL ADDITIONAL RESTRICTIONS. THE GROUND WATER MUST HAVE A KNOWN OR PROJECTED POINT OF ENTRY TO SURFACE WATER WITH NO STATISTICALLY SIGNIFICANT INCREASES IN CONTAMINANT CONCENTRATIONS IN SURFACE WATER, OR AT ANY POINT WHERE THERE IS REASON TO BELIEVE ACCUMULATION OF CONSTITUENTS MAY OCCUR DOWNSTREAM. IN ADDITION, THE REMEDIAL ACTION MUST INCLUDE ENFORCEABLE MEASURES THAT WILL PRECLUDE HUMAN EXPOSURE TO THE CONTAMINATED GROUND WATER AT ANY POINT BETWEEN THE FACILITY BOUNDARY AND ALL KNOWN AND PROJECTED POINTS OF ENTRY OF SUCH GROUND WATER INTO SURFACE WATER."

THE RCRA ACL GUIDANCE, PART II, (EPA/530-SW-87-031, OSWER DIRECTIVE 9481.00-11) PAGE XIV, STATES THAT "ACLS MAY BE BASED ON CONTAMINANT DISCHARGE INTO A SURFACE WATER BODY IF A FACILITY OWNS THE PROPERTY UP TO THE SURFACE WATER BODY," AND THE CONDITIONS ARE MET AS FOLLOWS:

- 1) THE CONTAMINANT PLUME HAS ALREADY REACHED THE SURFACE WATER BODY;
- 2) THE CONTAMINANTS DO NOT CAUSE A STATISTICALLY SIGNIFICANT INCREASE OVER BACKGROUND IN THE SURFACE WATER CONCENTRATIONS OF THOSE CONTAMINANTS; AND
- 3) THE CONTAMINANTS WILL NOT REACH A RECEPTOR AT AN UNSAFE LEVEL BEFORE THEY REACH THE SURFACE WATER BODY.

ALTHOUGH NO CONTAMINANTS HAVE BEEN DETECTED ABOVE SITE BACKGROUND CONCENTRATIONS IN THE STREAM, WELLS ADJACENT TO THE STREAM HAVE SHOWN DETECTIONS OF CONSTITUENTS. THEREFORE, IT IS CONCLUDED THAT CONTAMINANTS IN THE AQUIFER HAVE REACHED THE STREAM. THE SYSTEM OF MONITORING BOTH THE SURFACE WATER AND THE GROUND WATER PROVIDES ASSURANCE THAT CONTAMINATION CONCENTRATIONS INCREASING IN THE AQUIFER, AND IN THE STREAM, WILL BE DETECTED AND EVALUATED STATISTICALLY. INSTITUTIONAL CONTROLS AND A CONSERVATION EASEMENT, WHICH SHALL GRANT CONTROL OF THE SITE IN PERPETUITY TO A THIRD PARTY AND PROHIBIT FURTHER DEVELOPMENT OF THE PROPERTY, SHALL BE ENFORCED TO INSURE THAT CONTAMINANTS WILL NOT REACH RECEPTORS BEFORE THEY REACH THE SURFACE WATER BODY; NO ONE CAN INSTALL A WELL BETWEEN THE SITE AND THE STREAM WHERE THE PLUME IS DISCHARGING. THIS IS CONSISTENT WITH BOTH RCRA AND CERCLA REQUIREMENTS.

STATISTICAL PROCEDURES FOR EVALUATING CONCENTRATIONS IN GROUND WATER AND SURFACE WATER SHALL BE ADOPTED FROM THE EPA GUIDANCE DOCUMENT, STATISTICAL ANALYSIS OF GROUNDWATER MONITORING DATA AT RCRA FACILITIES, INTERIM FINAL GUIDANCE, APRIL 1989, AND THE ABOVE REFERENCED RCRA ACL GUIDANCE.

AQUIFER MONITORING

NINE POINTS OF COMPLIANCE (POC) WELLS (MWS 14, 14A, 9, 9A, 9B, 6, 6A, 8,

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AND 3 AS IDENTIFIED IN THE REMEDIAL INVESTIGATION (RI)) WILL BE MONITORED TO DETERMINE IF STATISTICALLY SIGNIFICANT INCREASES OF CONTAMINANTS OCCUR IN EXCEEDENCE OF APPLICABLE MCLS, ACLS, AND HEALTH-BASED DRINKING WATER LEVELS. INTRA-WELL STATISTICAL COMPARISONS SHALL BE UTILIZED TO MAKE THESE EVALUATIONS.

THE POC WELLS SHALL BE MONITORED QUARTERLY FOR THE COCS IDENTIFIED IN THE RI AND IN SECTION 5.5 OF THIS ROD. AN ARITHMETIC MEAN OF THE FIRST FOUR SAMPLES OF EACH CONSTITUENT FOR EACH WELL WILL BE COMPUTED. THE MEANS EXCEEDING MCLS WILL BECOME THE ACL FOR THAT CONSTITUENT, AND FOR MEANS THAT DO NOT EXCEED MCLS, THE MCL WILL BE THE APPLICABLE STANDARD. SEPARATE WELLS MAY HAVE A DIFFERENT ACL VALUE FOR A GIVEN CONSTITUENT.

APPLICABLE MCLS, MAXIMUM CONTAMINANT LEVEL GOALS (MCLGS), AND SECONDARY MAXIMUM CONTAMINANT LEVELS (SMCLS) FOR THE COCS LISTED IN SECTION 5.5 OF THIS ROD ARE DELINEATED IN TABLE 20. FINALIZED, PROMULGATED MCLS LISTED IN THIS TABLE WILL BE THE ENFORCEABLE LEVELS USED IN THE ESTABLISHMENT OF ACLS AT THE GSST SITE. PROPOSED MCLS ARE LISTED FOR ANTIMONY, NICKEL, CYANIDE, AND METHYLENE CHLORIDE. AN MCLG VALUE IS LISTED FOR COPPER AND A SMCL VALUE IS LISTED FOR ZINC. THE LISTED PROPOSED MCLS, MCLGS, AND SMCL ARE NOT ENFORCEABLE, BUT ARE "TO BE CONSIDERED" ARARS. THESE VALUES SHOULD BE CONSIDERED WHEN COMPUTING MEAN CONCENTRATIONS AND ESTABLISHING ACLS/MCLS AT THE GSST SITE. MCLS, MCLGS OR SMCL VALUES ARE NOT AVAILABLE FOR ACETONE, BIS(2-ETHYLHEXYL)PHTHALATE, AND 2-BUTANONE. THEREFORE, ACLS (OR MCLS) WILL NOT BE SET FOR THESE THREE CONSTITUENTS. HOWEVER, THE CONCENTRATIONS OF THESE THREE CONTAMINANTS SHALL BE MONITORED CLOSELY TO ENSURE STATISTICAL SIGNIFICANT INCREASES DO NOT OCCUR OVER TIME DURING THE LONG-TERM MONITORING PROGRAM.

ESTABLISHMENT OF REPRESENTATIVE MEAN CONCENTRATIONS FOR THE POC WELLS SHALL BE IN FULL ACCORDANCE WITH THE TWO PREVIOUSLY REFERENCED GUIDANCE DOCUMENTS IN THIS SECTION. DURING ANALYSIS OF A CONSTITUENT, THE REPORTED CONCENTRATION OF THE CONSTITUENT MAY BE BELOW THE METHOD DETECTION LIMIT (MDL) OF THE ANALYTICAL PROCEDURE. IF THIS OCCURS, THE ACTUAL MDL VALUE WILL BE SUBSTITUTED AS THE ACTUAL CONCENTRATION AND THE MEAN COMPUTED. THE FIRST YEAR OF SAMPLING (FIRST 4 QUARTERLY SAMPLES) WILL BE USED TO ESTABLISH MEAN CONCENTRATIONS FOR THE INDIVIDUAL POC WELLS. THE FIRST YEAR OF SAMPLING SHALL BEGIN UPON COMMENCEMENT OF THE REMEDIAL DESIGN PHASE OF THIS PROJECT.

GROUND WATER SAMPLES COLLECTED AFTER THE FIRST YEAR WILL BE COMPARED TO THE MEAN OF THE FIRST YEARS SAMPLING TO DETERMINE IF STATISTICALLY SIGNIFICANT INCREASES HAVE OCCURRED ABOVE MCLS AND ESTABLISHED ACLS. SAMPLES FOR COMPARISON WILL BE COLLECTED QUARTERLY FOR THREE YEARS AFTER COMMENCEMENT OF REMEDIAL ACTION. AT THAT TIME, THE FREQUENCY OF MONITORING WILL BE REVIEWED TO DETERMINE IF MODIFICATIONS ARE WARRANTED.

DURING THIS REVIEW, IF STATISTICAL DECREASES IN THE POC WELLS IS EVIDENT, THE FREQUENCY OF SAMPLING WILL BE REDUCED TO SEMI-ANNUAL (TWICE YEARLY) UP TO THE FIVE YEAR REVIEW OF THE SITE. IF STATISTICAL DECREASES ARE NOT INHERENTLY OBVIOUS, QUARTERLY SAMPLING WILL CONTINUE

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THROUGH THE FIVE YEAR REVIEW. A COMPREHENSIVE EVALUATION OF THE MONITORING PROGRAM WILL OCCUR DURING THE FIVE YEAR REVIEW TO EVALUATE IF CHANGES IN THE PROGRAM ARE WARRANTED.

DUE TO THE COMPLEXITY AND LENGTH OF THE STATISTICAL COMPARISON TECHNIQUES REQUIRED FOR THIS MONITORING PROGRAM, THEY ARE NOT INCLUDED IN THIS DOCUMENT. SECTION 6 OF THE ABOVE REFERENCED STATISTICAL GUIDANCE DESCRIBES PROCEDURES FOR COMPARISONS WITH MCLS OR ACLS. THE STATISTICAL COMPARISON METHODS UTILIZED AS PART OF THIS REMEDY SHALL BE CONSISTENT AND IN FULL ACCORDANCE WITH THE ABOVE REFERENCED DOCUMENT.

IF A SIGNIFICANT INCREASE IN CONSTITUENT CONCENTRATION IS DETECTED, ANOTHER SAMPLE WILL BE COLLECTED WITHIN A REASONABLY SHORT TIME FRAME TO DETERMINE IF THE DETECTION IS A FALSE POSITIVE. THIS WILL BE A CHECKING SYSTEM TO CONFIRM THAT SAMPLING ERROR OR ANALYTICAL ERROR HAS NOT CAUSED A FALSE POSITIVE.

IF A SIGNIFICANT INCREASE ABOVE APPLICABLE ACLS, MCLS, OR HEALTH-BASED LEVELS IS CONFIRMED, ADDITIONAL MONITORING WELLS WILL BE INSTALLED IN THE AREA OF THE SUSPECT WELL(S) TO DEFINE THE EXTENT OF CONTAMINATION, AND DETERMINE IF ACTIVE GROUND WATER REMEDIATION IS NECESSARY.

ADDITIONALLY, MONITORING WELLS 4, 4A, 5, AND 7 (AS DEFINED BY THE RI) SHALL BE SAMPLED AND ANALYZED DURING THE IMPLEMENTATION OF REMEDIAL ACTION AT THE SITE. THIS "SOURCE AREA WELL" MONITORING WILL BE CONDUCTED DURING THREE SAMPLING EVENTS WHICH WILL OCCUR DURING THE SECOND YEAR OF THE FIVE YEAR PROGRAM. THIS WILL ALLOW ADEQUATE TIME FOR RD/RA NEGOTIATIONS AND REMEDIAL DESIGN. THE FIRST SAMPLING EVENT OF THE SOURCE AREA WELLS SHALL BE CONDUCTED PRIOR TO REMEDIAL ACTION ACTIVITIES AND SAMPLES COLLECTED FROM THESE WELLS SHALL BE ANALYZED FOR THE TAL AND TCL PARAMETERS, EXCLUDING PESTICIDES AND PCBS. THE SECOND SAMPLING EVENT SHALL OCCUR DURING EXCAVATION ACTIVITIES AND SAMPLES SHALL BE ANALYZED FOR THE COC LIST. THE THIRD SAMPLING EVENT OF THESE WELLS SHALL BE COLLECTED AFTER EXCAVATION OF WASTE MATERIAL HAS OCCURRED AND SAMPLES SHALL BE ANALYZED FOR THE TAL AND TCL PARAMETERS, EXCLUDING PESTICIDES AND PCBS. THIS SAMPLING REGIME WILL BE IMPLEMENTED IN AN EFFORT TO ENSURE THAT A SLUG OF CONTAMINANTS IS NOT RELEASED AS A RESULT OF DISRUPTION OF THE UNDERLYING SOIL DURING EXCAVATION OF THE IDENTIFIED WASTE LAYERS. THIS ADDITIONAL MONITORING SHALL SERVE AS AN EARLY WARNING DEVICE IF THE MOBILITY OF THE CONTAMINANTS BENEATH THE VISIBLE WASTE LAYERS IS INCREASED DURING IMPLEMENTATION OF REMEDIAL ACTION.

FINALLY, MONITORING WELLS 4, 4A, 5 AND 7 SHALL BE SAMPLED DURING THE FINAL SAMPLING EVENT OF THE PROPOSED FIVE YEAR GROUND WATER MONITORING PROGRAM. THESE SAMPLES WILL BE ANALYZED FOR THE FULL TAL/TCL PARAMETER LIST, EXCLUDING PESTICIDES AND PCBS. THESE RESULTS WILL BE UTILIZED

DURING THE FIVE YEAR REVIEW TO DETERMINE IF TREATMENT OF IDENTIFIED WASTE BY SOLIDIFICATION HAS BEEN EFFECTIVE IN IMMOBILIZING WASTE CONSTITUENTS IN A SOLID MONOLITH AND TO EVALUATE IF SOURCE TREATMENT BY SOLIDIFICATION REMAINS TO BE ADEQUATELY PROTECTIVE OF HUMAN HEALTH AND

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THE ENVIRONMENT.

STREAM MONITORING

STREAM MONITORING WILL BE CONDUCTED BY COMPARING A BACKGROUND MONITORING STATION (SW-1 FROM THE RI REPORT) TO STATIONS (SW 2, 3, AND 4) IN THE AREA OF SUSPECTED GROUND WATER DISCHARGE TO THE STREAM. THE CURRENT LOCATION OF SW-3 WILL BE RELOCATED DOWNSTREAM TO AN AREA DUE WEST OF MONITORING WELL PAIR MW-06/6A. THIS RELOCATION OF SW-3 WILL PROVIDE A MORE STRATEGIC STREAM MONITORING NETWORK TO MONITOR SUSPECTED AREAS OF GROUND WATER DISCHARGE TO THE STREAM. THE ABOVE REFERENCED GUIDANCE DOCUMENTS WILL BE USED TO DETERMINE IF A STATISTICALLY SIGNIFICANT INCREASE OF CONTAMINANT CONCENTRATIONS OCCURS FROM THE UPGRADIENT SAMPLE TO THE DOWNGRAIENT SAMPLES. SAMPLING WILL BE CONDUCTED ON THE SAME SCHEDULE AS THE GROUND WATER SAMPLING. THE RCRA ACL GUIDANCE, PART II, CASE STUDY 4 DESCRIBES COMPARABLE PROCEDURES TO BE FOLLOWED IN MONITORING THE STREAM.

MAXIMUM ALLOWABLE EXPOSURE CONCENTRATIONS FOR THE CONTAMINANTS OF CONCERN WILL BE DEVELOPED FOR THE WATERS OF THE CREEK. THE EXPOSURE PATHWAYS TO BE CONSIDERED WILL BE HUMAN INGESTION OF DRINKING WATER, HUMAN INGESTION OF FISH, AND AMBIENT WATER QUALITY CRITERIA FOR AQUATIC LIFE.

IF STATISTICALLY SIGNIFICANT INCREASES OF CONTAMINANTS OCCURS OR MAXIMUM ALLOWABLE EXPOSURE CONCENTRATIONS ARE EXCEEDED, THE NEED FOR ACTIVE REMEDIATION OF GROUND WATER WILL BE RE-EVALUATED TO DETERMINE IF REMEDIATION IS WARRANTED.

TABLE 21 DEPICTS THE ABOVE DESCRIBED LONG-TERM MONITORING PROGRAM FOR THE POC WELLS, SOURCE AREA WELLS, AND STREAM STATIONS.

LAGOON SURFACE WATER

ANALYSES OF WATER SAMPLES COLLECTED FROM OPEN LAGOON NOS. 1 AND 4 INDICATED THE PRESENCE OF CADMIUM AND CHROMIUM AT CONCENTRATIONS THAT EXCEEDED MCLS. MAXIMUM CONTAMINANT LEVELS ESTABLISHED BY THE SAFE DRINKING WATER ACT ARE APPLICABLE CHEMICAL-SPECIFIC REQUIREMENTS FOR SURFACE WATER IMPOUNDED IN THE OPEN LAGOONS.

THE SELECTED REMEDY FOR THE GOLDEN STRIP SEPTIC TANK SITE SHALL INCLUDE COLLECTION AND DISCHARGE OF THE SURFACE WATER IMPOUNDED IN THESE LAGOONS TO THE LOCAL PUBLICLY OWNED TREATMENT WORKS (POTW). PRELIMINARY DISCUSSIONS WITH WESTERN CAROLINA REGIONAL SEWER AUTHORITY (WCRSA) AND METROPOLITAN SEWER DISTRICT (MSD), THE LOCAL REGULATORY AUTHORITIES, INDICATE THAT THE FEASIBILITY OF DISCHARGING THE LAGOON WATER TO THE

POTW IS BOTH REASONABLE AND COST-EFFECTIVE. PRETREATMENT OF THE DISCHARGE WILL BE REQUIRED IF CONSTITUENTS EXCEED WCRSA'S STANDARDS. FURTHER SAMPLING AND ANALYSIS OF THE LAGOON WATER TO BE DISCHARGED SHALL BE CONDUCTED TO DETERMINE ITS QUALITY. RI DATA COMPILED THUS FAR

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INDICATE PRETREATMENT MAY NOT BE NECESSARY.

ALL SURFACE WATER DISCHARGED TO THE LOCAL POTW SHALL BE IN FULL ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL REGULATIONS. THE ESTIMATED VOLUME OF SURFACE WATER TO BE IMPOUNDED IN THE LAGOONS IS APPROXIMATELY 1.9 MILLION GALLONS.

LONG-TERM OPERATION AND MAINTENANCE

A LONG-TERM OPERATION AND MAINTENANCE (O&M) PROGRAM SHALL ALSO BE IMPLEMENTED AS PART OF THE SELECTED REMEDY. THIS O&M PROGRAM SHALL BE IMPLEMENTED TO ASSESS THE EFFECT OF SOLIDIFIED WASTE CONSTITUENTS ON THE SITE OVER A 30-YEAR DESIGN LIFE. ADDITIONALLY, THIS PROGRAM SHALL ENSURE INSTITUTIONAL CONTROLS OF THE SITE ARE MAINTAINED FOR THE 30-YEAR PERIOD. THE 30-YEAR PERIOD IS THE MAXIMUM PERIOD RECOMMENDED FOR ANALYSIS BY EPA RI/FS GUIDANCE.

THE O&M PROGRAM WILL CONSIST OF LONG-TERM GROUND WATER MONITORING, SURFACE SOIL, AND SEDIMENT MONITORING. THE SOLIDIFIED MONOLITH SHALL ALSO BE MONITORED TO ENSURE THE SELECTED REMEDY REMAINS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT OVER THE 30-YEAR PERIOD. THE DETAILS OF THE 30-YEAR O&M PROGRAM SHALL BE DETERMINED DURING THE REMEDIAL DESIGN PHASE OF THIS PROJECT.

COST SUMMARY FOR THE SELECTED REMEDY

ASSOCIATED COSTS FOR THE SELECTED REMEDY AS OUTLINED ABOVE ARE DELINEATED IN DETAIL IN TABLE 22. COSTS ASSOCIATED WITH THE FIVE YEAR AQUIFER AND STREAM MONITORING ARE NOT INCLUDED IN THIS ESTIMATE. HOWEVER, THE COSTS ASSOCIATED WITH THIS PROGRAM ARE NOT EXPECTED TO SIGNIFICANTLY INCREASE THE ESTIMATED TOTAL COST OF \$4,530,000 FOR IMPLEMENTATION OF THIS REMEDY.

#STD STATUTORY DETERMINATIONS

EPA'S PRIMARY RESPONSIBILITY AT SUPERFUND SITES IS TO SELECT REMEDIAL ACTIONS THAT ARE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT. IN ADDITION, SECTION 121 OF CERCLA ESTABLISHES SEVERAL OTHER STATUTORY REQUIREMENTS AND PREFERENCES. THESE SPECIFY THAT WHEN COMPLETE, THE SELECTED REMEDY FOR THIS SITE MUST COMPLY WITH APPLICABLE OR RELEVANT AND APPROPRIATE ENVIRONMENTAL STANDARDS ESTABLISHED UNDER FEDERAL AND STATE ENVIRONMENTAL LAWS UNLESS A STATUTORY WAIVER IS JUSTIFIED. THE SELECTED REMEDY ALSO MUST BE COST-EFFECTIVE AND UTILIZE PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY

TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE. FINALLY, THE STATUTE INCLUDES A PREFERENCE FOR REMEDIES THAT EMPLOY TREATMENT THAT PERMANENTLY AND SIGNIFICANTLY REDUCE THE VOLUME, TOXICITY, OR MOBILITY OF HAZARDOUS WASTES AS THEIR PRINCIPAL ELEMENT. THE FOLLOWING SECTIONS

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DISCUSS HOW THE SELECTED REMEDY FOR THE GOLDEN STRIP SEPTIC TANK SITE MEETS THESE STATUTORY DETERMINATIONS.

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

THE SELECTED REMEDY FOR THE GOLDEN STRIP SEPTIC TANK SITE PROTECTS HUMAN HEALTH AND THE ENVIRONMENT THROUGH TREATMENT BY SOLIDIFICATION OF THE LAGOON WASTES/SLUDGE AND CONTAMINATED SOILS. DERMAL CONTACT WITH THE WASTE CONSTITUENTS IN THE LAGOON SLUDGES AND CONTAMINATED SOILS IS THE PRIMARY EXPOSURE THREAT POSED TO HUMAN HEALTH. SOLIDIFICATION OF THE IDENTIFIED WASTE CONSTITUENTS WILL ELIMINATE THIS THREAT BY PREVENTING DIRECT CONTACT WITH THE IDENTIFIED WASTE CONSTITUENTS. ADDITIONALLY, TREATMENT OF THE CONTAMINATED SOIL AND LAGOON WASTE BY SOLIDIFICATION WILL IMMOBILIZE THE CONTINUING SOURCE AREAS AND THE PRIMARY EXPOSURE THREAT TO THE ENVIRONMENT.

THE CURRENT RISKS POSED BY THE SITE ARE AN UPPER BOUND CARCINOGENIC RISK OF $2.3 \times (10^{-5})$ AND A RESULTANT NON-CARCINOGENIC RISK, OR HAZARD INDEX, OF 8.2. THE REMEDY SELECTED IN THIS ROD WHICH PROVIDES A HIGH DEGREE OF PERMANENCE REDUCES THE CARCINOGENIC RISK TO $2.0 \times (10^{-5})$ AND THE NON-CARCINOGENIC RISK TO 0.17. BOTH OF THESE VALUES ARE WITHIN THE ACCEPTABLE RANGE ESTABLISHED BY EPA.

POTENTIAL SHORT-TERM RISKS POSED BY THE SELECTED REMEDY DUE TO THE INCREASED POTENTIAL FOR EROSION OF AFFECTED MATERIALS BY WIND AND RAIN DURING EXCAVATION AND STAGING, WILL BE CONTROLLED BY STANDARD ENGINEERING PRACTICES, SUCH AS DUST CONTROL ACTIVITIES AND SILT FENCES. NO UNACCEPTABLE SHORT-TERM RISKS OR CROSS-MEDIA IMPACTS WILL BE CAUSED BY IMPLEMENTATION OF THE SELECTED REMEDY.

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

THE SELECTED REMEDY OF EXCAVATION, TREATMENT BY SOLIDIFICATION OF CONTAMINATED SOIL AND LAGOON SLUDGE AND ON-SITE DISPOSAL BY BACKFILLING WILL BE IN FULL COMPLIANCE WITH ALL APPLICABLE OR RELEVANT AND APPROPRIATE CHEMICAL-, ACTION-, AND LOCATION-SPECIFIC REQUIREMENTS (ARARS). THE ARARS ARE PRESENTED BELOW.

CHEMICAL-SPECIFIC ARARS

THERE ARE NO CHEMICAL-SPECIFIC ARARS FOR SOIL AND SEDIMENT FOR THE CONSTITUENTS OF CONCERN AT THE SITE. HOWEVER, CONTAMINATED SOILS AND SLUDGES PRESENT AT THE SITE WILL BE REMEDIATED TO THE REMEDIAL ACTION TARGET CONCENTRATIONS DERIVED FROM THE BASELINE RISK ASSESSMENT AND THE CALCULATED RISK POTENTIALS FOR BOTH CARCINOGENIC AND NON-CARCINOGENIC EFFECTS. THESE TARGET CONCENTRATIONS ARE DELINEATED IN TABLE 18 OF THIS

ROD.

CHEMICAL-SPECIFIC ARARS FOR GROUND WATER AT THE SITE ARE THE SAFE DRINKING WATER ACT (SDWA) MAXIMUM CONTAMINANT LEVELS (MCLS). HOWEVER,

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ACTIVE AQUIFER REMEDIATION TO ATTAIN MCLS IN THE GROUND WATER AT THE SITE HAS BEEN DETERMINED TO BE UNREASONABLE AND NOT TECHNICALLY PRACTICABLE. PURSUANT TO SECTION 121 OF CERCLA, ESTABLISHMENT OF ALTERNATE CONCENTRATION LIMITS (ACLS) FOR THE GROUND WATER AT THE SITE HAVE BEEN DETERMINED TO BE THE APPLICABLE STANDARD. THE APPLICABILITY FOR THE ESTABLISHMENT OF ACLS AT THE GSST HAS BEEN DEVELOPED IN DETAIL IN SECTION 4.0 AND 9.0 OF THIS DOCUMENT. GROUND WATER AT THE SITE ATTAINS ALL APPLICABLE REQUIREMENTS FOR THE ESTABLISHMENT OF ACLS.

CHEMICAL-SPECIFIC ARARS FOR THE SURFACE WATER IMPOUNDED IN LAGOONS 1 AND 4 ARE THE SDWA MCLS. THIS WATER WILL BE COLLECTED AND DISCHARGED TO THE LOCAL POTW AND WILL ATTAIN THE APPLICABLE STANDARD.

ACTION-SPECIFIC ARARS

PLACEMENT OF HAZARDOUS WASTE AS DEFINED BY THE RCRA LAND DISPOSAL RESTRICTIONS IS NOT APPLICABLE TO THE SELECTED REMEDY. THEREFORE, MINIMUM TECHNOLOGY REQUIREMENTS ARE NOT APPLICABLE. HOWEVER, WASTE PRESENT AT THE SITE HAS BEEN DETERMINED TO BE "CHARACTERISTIC". THE PERFORMANCE STANDARDS AS IMPOSED BY THE LDRS FOR WASTE CHARACTERISTICS EXHIBITED BY THE TOXICITY CHARACTERISTIC LEACHING PROCEDURE ANALYSIS OF THE EXCAVATED MATERIALS ARE APPLICABLE. LDR CONCENTRATION-BASED STANDARDS (BEST DEMONSTRATED AVAILABLE TECHNOLOGY LEVELS) FOR THE STABILIZED/SOLIDIFIED SOILS AND SLUDGE SHALL BE MET PRIOR TO ON-SITE DISPOSAL. THESE REGULATORY LIMITS ARE DELINEATED IN TABLE 19 OF THIS ROD.

ADDITIONALLY, TREATMENT BY SOLIDIFICATION OF THE WASTE CONSTITUENTS THAT SHALL RESULT IN A LEVEL THAT IS ADEQUATELY PROTECTIVE OF THE GROUND WATER AT THE SITE HAS BEEN DETERMINED TO BE RELEVANT AND APPROPRIATE.

LOCATION-SPECIFIC ARARS

NONE.

COST-EFFECTIVENESS

EPA BELIEVES THE SELECTED REMEDY IS COST EFFECTIVE IN MITIGATING THE PRINCIPAL RISK POSED TO HUMAN HEALTH AND THE ENVIRONMENT. THE SELECTED REMEDY PROVIDES THE HIGHEST DEGREE OF PERMANENCE AT COSTS THAT ARE MID-RANGE WHEN COMPARED TO OTHER ALTERNATIVES CONSIDERED FOR REMEDIAL ACTION AT THE SITE. THE SELECTED REMEDY ADEQUATELY MEETS ALL EVALUATION CRITERIA AND PROVIDES OVERALL EFFECTIVENESS IN PROPORTION TO ITS COST. THE ESTIMATED COST FOR THE SELECTED REMEDY IS APPROXIMATELY \$4,500,000.

UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT

TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE
MAXIMUM EXTENT PRACTICABLE (MEP)

EPA AND THE STATE OF SOUTH CAROLINA HAVE DETERMINED THAT THE SELECTED

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REMEDY REPRESENTS THE MAXIMUM EXTENT TO WHICH PERMANENT SOLUTIONS AND TREATMENT TECHNOLOGIES CAN BE UTILIZED IN A COST-EFFECTIVE MANNER FOR SOURCE CONTROL REMEDIATION AT THE GOLDEN STRIP SEPTIC TANK SITE. OF THOSE ALTERNATIVES THAT ARE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT AND COMPLY WITH ARARS, EPA AND THE STATE HAVE DETERMINED THAT THE SELECTED REMEDY PROVIDES THE BEST OVERALL BALANCE OF TRADEOFFS IN TERMS OF THE FIVE BALANCING CRITERIA: LONG-TERM EFFECTIVENESS AND PERMANENCE; REDUCTION OF TOXICITY, MOBILITY, OR VOLUME; SHORT-TERM EFFECTIVENESS; IMPLEMENTABILITY; AND COST. ADDITIONALLY, THE SELECTED REMEDY FULFILLS THE TWO MODIFYING CRITERIA: STATE ACCEPTANCE; AND COMMUNITY ACCEPTANCE.

THE SELECTED REMEDY MEETS THE STATUTORY PREFERENCE TO UTILIZE PERMANENT SOLUTIONS AND TREATMENT TECHNOLOGIES, TO THE MAXIMUM EXTENT PRACTICABLE. CONTAINMENT BY CAPPING THE WASTE CONSTITUENT SOURCE AREAS ACHIEVES THE SAME LEVEL OF RISK REDUCTION FOR APPROXIMATELY 40 PERCENT LESS COST, BUT PROVIDES LESS PERMANENCE AND LONG-TERM EFFECTIVENESS. SOURCE REMOVAL ALSO ACHIEVES SUBSTANTIAL RISK REDUCTION IN TERMS OF FUTURE EXPOSURE TO WASTE CONSTITUENTS, BUT THE SHORT-TERM RISKS ARE GREATER AND THE COSTS ARE MUCH HIGHER.

TREATMENT BY SOLIDIFICATION HAS BEEN ROUTINELY APPLIED WITH SUCCESSFUL RESULTS TO SOILS THAT ARE TYPICAL TO THIS REGION OF SOUTH CAROLINA. HOWEVER, IN-SITU SOLIDIFICATION PROCESSES HAVE NOT BEEN WELL DEMONSTRATED FOR THE TYPICAL SOILS FOR THIS REGION OR FOR THE LARGE AREAS REQUIRING REMEDIATION AT THE SITE. THE SELECTED REMEDY CAN BE IMPLEMENTED RAPIDLY WITH PROVEN TECHNOLOGY AND AT LESS COST THAN THE OTHER TREATMENT ALTERNATIVES CONSIDERED. FOR THESE REASONS, EXCAVATION OF AFFECTED MATERIALS, SOLIDIFICATION OF CONTAMINATED SOILS AND SLUDGE, AND ON-SITE DISPOSAL BY BACKFILLING IN ON-SITE EXCAVATIONS HAS BEEN DETERMINED TO BE THE MOST APPROPRIATE SOLUTION FOR THE GOLDEN STRIP SEPTIC TANK SITE.

PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

BY TREATING THE CONTAMINATED SOILS AND LAGOON SLUDGES BY SOLIDIFICATION, THE SELECTED REMEDY ADDRESSES THE PRINCIPAL THREATS POSED TO HUMAN HEALTH AND THE ENVIRONMENT BY THE SITE THROUGH THE USE OF A PROVEN TREATMENT TECHNOLOGY. THEREFORE, THE STATUTORY PREFERENCE FOR REMEDIES THAT EMPLOY TREATMENT AS A PRINCIPAL ELEMENT IS SATISFIED.

DURING THE PUBLIC COMMENT PERIOD. EPA'S RESPONSES TO THESE COMMENTS ARE ALSO ATTACHED AND WERE MAILED DIRECTLY TO THE CITIZENS ADDRESSED.

#TA

TABLE 17
COMPARISON OF COSTS
FOR PHASE III ALTERNATIVES

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ALTERNATIVE	PRESENT-WORTH COST	CAPITAL COST
1. NO ACTION	\$ 1,300,000	\$ 60,000
2. INSTITUTIONAL CONTROLS	\$ 1,400,000	\$ 81,000
3. CONTAINMENT OF SOLIDS		
A. COMPOSITE COVER	\$ 3,200,000	\$ 2,200,000
4. TREATMENT AND OFF-SITE DISPOSAL OF SOLIDS	\$ 12,500,000	\$ 11,500,000
5. TREATMENT AND OFF-SITE DISPOSAL OF SLUDGE AND CONTAINMENT OF AFFECTED SOILS	\$ 6,100,000	\$ 5,100,000
7. ON-SITE TREATMENT AND DISPOSAL OF SOLIDS		
C. STABILIZATION	\$ 4,500,000	\$ 3,500,000
8. IN SITU TREATMENT OF SOLIDS		
B. IN SITU STABILIZATION	\$ 4,100,000	\$ 3,100,000

TABLE 17
COMPARISON OF COSTS
FOR PHASE III ALTERNATIVES
(CONTINUED)

ALTERNATIVE	ANNUAL MONITORING AND MAINTENANCE COST (30-YR)
1. NO ACTION	\$ 83,000
2. INSTITUTIONAL CONTROLS	\$ 83,000
3. CONTAINMENT OF SOLIDS	
A. COMPOSITE COVER	\$ 65,000
4. TREATMENT AND OFF-SITE DISPOSAL OF SOLIDS	\$ 65,000
5. TREATMENT AND OFF-SITE DISPOSAL OF SLUDGE AND CONTAINMENT OF AFFECTED SOILS	\$ 65,000
7. ON-SITE TREATMENT AND DISPOSAL OF SOLIDS	
C. STABILIZATION	\$ 65,000
8. IN SITU TREATMENT OF SOLIDS	
B. IN SITU STABILIZATION	\$ 65,000

TABLE 18

REMEDIAL ACTION TARGET CONCENTRATIONS(A)
SOIL AND SLUDGE
GOLDEN STRIP SEPTIC TANK

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CONSTITUENT	REMEDIAL ACTION TARGET(B) CONCENTRATION (MG/KG)
ANTIMONY	26
ARSENIC	18
CADMIUM	65
CHROMIUM(C)	580
COPPER	2,400
CYANIDE	1,300
LEAD	500
MERCURY	20
NICKEL	1,300
ZINC	13,000
ACETONE	6,000
BIS(2-ETHYLHEXYL)PHTHALATE	200
2-BUTANONE	3,000
CHLOROBENZENE	1,200
1,2-DICHLOROETHENE (TOTAL)	1,200
ETHYLBENZENE	6,000
METHYLENE CHLORIDE	380
STYRENE	95
TETRACHLOROETHENE	56
TOLUENE	12,000
1,1,1-TRICHLOROETHANE	5,500
XYLENES (TOTAL)	120,000

(A) - REMEDIAL ACTION TARGET CONCENTRATIONS BASED ON A CARCINOGENIC RISK OF 1 X (10 - 6) (ARSENIC IS BASED ON A CARCINOGENIC RISK OF 1 X (10 - 5) OR A HAZARD INDEX OF 0.3.

(B)- REMEDIAL ACTION TARGET CONCENTRATIONS BASED ON MOST CONSERVATIVE EXPOSURE SCENARIO (FUTURE USE SCENARIO #2) ASSUMING A RESIDENCE AT THE SITE, AND IS DISCUSSED IN SECTION 6.0 OF THIS RECORD OF DECISION.

(C) - CHROMIUM CONCENTRATION INCLUDES ASSUMPTION THAT 10 PERCENT OF TOTAL CHROMIUM OBSERVED IS IN THE HEXAVALENT STATE.

TABLE 20
APPLICABLE MCL, MCLG, SMCL VALUES FOR CONSTITUENTS OF CONCERN
GOLDEN STRIP SEPTIC TANK SITE

CONSTITUENT	MCL (PPM)(A)	MCLG (PPM)(B)	SMCL (PPM)(C)
ANTIMONY	* 0.01/0.005		

ARSENIC	0.050
CADMIUM	0.005
CHROMIUM	0.1
COPPER	1.3

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LEAD	0.015(D)
MERCURY	0.002
NICKEL	* 0.1
ZINC	5.0
CYANIDE	* 0.2
ACETONE	N/A
BIS(2-ETHYLHEXYL) PHTHALATE	N/A
2-BUTANONE	N/A
CHLOROBENZENE	0.1
CHLOROFORM	0.1(E)
1,2-DICHLOROETHANE	0.005
1,2-DICHLOROETHENE (TOTAL)	0.07
1,2-DICHLOROPROPANE	0.005
ETHYLBENZENE	0.7
METHYLENE CHLORIDE	0.005
STYRENE	0.1
TETRACHLOROETHENE	0.005
TOLUENE	1.0
1,1,1-TRICHLOROETHANE	0.2
XYLENES (TOTAL)	10.0

- (A) - MAXIMUM CONTAMINANT LEVEL (NATIONAL PRIMARY DRINKING WATER REGULATIONS)
- (B) - MAXIMUM CONTAMINANT LEVEL GOAL (NATIONAL PRIMARY DRINKING WATER REGULATIONS)
- (C) - SECONDARY MAXIMUM CONTAMINANT LEVEL (SECONDARY DRINKING WATER REGULATIONS)
- (D) - "CLEANUP LEVEL FOR LEAD IN GROUNDWATER, JUNE 21, 1990 DIRECTIVE FROM EPA HEADQUARTERS, OFFICE OF EMERGENCY AND REMEDIAL RESPONSE.
- (E) - MCL IS FOR TOTAL TRIHALOMETHANES.
- * - PROPOSED MCL.
- N/A - VALUE IS NOT AVAILABLE.